ENGINEERING NEWS

AND

AMERICAN RAILWAY JOURNAL.

VOL. XXII. No. 32.

TABLE OF CONTENTS.

Engineering News of the Week 121, 122

Technical and Illustrated Articles

Drainage of the Mexico Valley 122
The Future of Western Railways 124
The Wells System of Lighting 124
The Perfected Clayton Air-Compressor 125
Ship Canals in 1889 (*Concluded.*) 126
Sewage Disposal at Milwaukee, Wis 128
Electric Railways in Boston 129
Problems to be Discussed by a Rapid Transit Commission 129
Railway Schemes in the Northwest 130
Portland Cement Testing 137

Personals, Book Reviews, Publications Received, Society Proceedings 130, 131

Editorials and Editorial Notes 132, 133

The Future of Western Railways.—A World's Fair in 1892 and the Proper Site Therefor.—The Sewerage of New York City.—The *California Architect* and the Eiffel Tower.—English Investments in American Manufacturing Enterprises.—Plates Rolled from Molten Metal.—Statistics of Irrigation in Utah.—The Seymour Process for Producing Aluminium.

Sectional Representation in National Engineering Societies 133

Passenger Lifts and Rapid Transit 135

Correspondence 136, 137

House Numbering.—The New St. Augustine Artesian Well.—The Kutter Fund—Correction.

Railways, Rapid Transit ..... 137,—140

Highways, Contracting, Proposals Open, Manufacturing and Technical, Bridges and Canals, Electrical, Sewerage and Municipal, Water-Works ..... 140,—144

ENGINEERING NEWS.

THE GLOBE SEWER PIPE CO., of Pittsburg, Pa., most emphatically denies the current rumors of the collapse of the syndicate of sewer pipe manufacturers represented by them. They state that these reports are false and malicious, doubtless started by parties anxious, for personal reasons, to see their company retire from the markets. They wish it to be distinctly understood that "they have come to stay."

THE STEAMSHIP *Columbia*, of the Hamburg American Packet Co., on her second trip across the Atlantic, beat the remarkable record of her maiden trip by 2 hrs. 4 min. There seems good prospect that this wonderfully fast steamer will soon stand at the head of transatlantic liners in point of speed. On this trip she left her dock at Hoboken at 8 A. M. on Thursday Aug. 1, and passed Sandy Hook 9.50. She arrived at the Needles, off Southampton, at 10 A. M. Aug. 8. Deducing the difference in actual time, the record stands at 6 d. 19 hrs. 19 min. 36 sec.

THE STEAMSHIP *Montreal* of the Dominion Line, which sailed from Montreal on July 31 for Liverpool, went ashore near the landing at Belle Isle in a dense fog at 10.30 P. M. on Aug. 4. All hands were saved. The passengers and crew are still on the island awaiting a steamer to take them to Liverpool. The ship is a total wreck and there is no chance of salvage.

THE NICARAGUA CANAL CO. evidently proposes to profit by the ill experience of the Panama management. A late letter from Greytown says that while "sickness, starvation, dissipation, and despair marked the route projected by the French financiers, health, plenty of food, decency, and quiet are the characteristics of the American engineers and their assistants." The Panama people paid their labor so much a month, and allowed them to "find themselves"; and the result was a minimum of solid food and a maximum of strong drink, with resulting sickness and a terribly long death list. The American company, on the other hand, proposes to pay as high wages, but in addition will supply the laborers with good, wholesome food, shipped from New York, and will equip stores under their own control at which general supplies can be purchased at New York prices. This company is also taking care to house its men well in portable dwellings and a steel pipe line is already being laid down, 15 miles long, bringing perfectly pure water from the Deseado basin to Greytown. Contractors from New York, Chicago, and San Francisco are on the ground preparing bids, and the inauguration of active work is expected shortly, in addition to the work now being done at Greytown.

SPOKANE FALLS, the third city in Washington Territory, was the scene of a great conflagration on the night of August 4 in which almost the whole business district of the city was wiped out, causing a loss estimated at from six to ten million dollars. This third conflagration, following close after those at Seattle and Ellensburg, gives additional proof of the dangers from crowding wooden buildings too closely in business districts. The city of Seattle has passed additional building regulations since the adoption of those noted in our issue of July 20. Evidently the lesson of her own conflagration was not lost on her.

THE DANGEROUS CHARACTER OF NAPHTHA has been again shown by an explosion on Aug. 7 at Buffalo on a pleasure launch which used naphtha for fuel. The boat was about 15 tons burden and was owned by Mr. L. B. CROCKER, Superintendent of the New York Central stockyards at Buffalo. The boat was lying inside the boat house and the explosion took place without warning, killing four persons and turning boat and boat house into a mass of flames almost instantly.

THE MOST SERIOUS RAILWAY ACCIDENT of the week was a very curious collision Aug. 2, at Kenwood Junction, near Albany, N. Y., between a Delaware & Hudson and a West Shore passenger train, and was caused by a misplaced switch, where the Delaware & Hudson tracks turn to the west. A south-bound West Shore train had passed, and a north-bound train was backing from a side track onto the main line. A Delaware & Hudson train from Albany to Binghamton was due, and the switch should have been set to turn this train onto the west-bound track. This switch, however, had not been set after the passage of the south-bound train, and the train ran down the line and struck the side of the West Shore train, which was backing onto the main track, a glancing blow, turning 2 cars over on their sides. It is said that the switchman had not been properly notified of the approach of the Delaware & Hudson train. One man was killed, and 15 persons were more or less injured. There is an ordinary target at the switch, but the engineer did not notice its position until it was too late to stop.

A head collision between a passenger and freight train occurred July 31, on the Cincinnati, Hamilton & Dayton Railway, near Oxford, O., resulting in the death of both engineers and firemen and the baggage-master.

BRIDGE ACCIDENTS are reported as follows: A bridge on the Oregon Railway & Navigation Co.'s line, near Riparia, W. T., was burned July 26.—A railway bridge at Ortega, Cal., was burned July 27.—A culvert on the Union Pacific Ry., at Weston, Neb., gave way under a freight train Aug. 6, its supports having been washed out.—The recent floods in Virginia washed away 2 or 3 bridges and several trestles on the Danville & New River Ry.—The stone bridge at W. Clinton Ave., Irvington, N. J., was washed out by the flood last week.—A highway bridge across the Blanche river, in Ottawa county, Canada, gave way under a team July 31.

THE JYNTHEE BRIDGE ACCIDENT, in India, mentioned last week, is further described as follows in *The Indian Engineer*: "This is a large bridge of several spans of 80-ft. Warren girders. These girders being considered weak for the heavy traffic, were lately strengthened by building piers in the middle. It is surmised that the waterway was so much blocked up by these additional supports that the flood scoured out and undermined two of the piers, which, together with one span of girders, have fallen. Luckily no one was hurt, and no damage done beyond that to the bridge itself." This method of strengthening bridges is a very poor one, unless for temporary purposes.

RAINSTORMS AND FLOODS continue to be reported During the past week Connecticut, New York, New Jersey, and Virginia have suffered most. In Middlesex county, Conn., several mill dams were carried away; also one near Meriden and another near Menands, near Troy, N. Y. The lake at Avon, N. J., was flooded to such a height that it burst the bank, and the water ran into the sea. Richmond, Va., was partly flooded last week, and the gas works were drowned out, but by the end of the week the water in the James river was falling.

AN EXPLOSION OCCURRED in the baggage car of a passenger train on the Grand Trunk Ry., Aug. 2, after the train had passed through the Victoria bridge. Considerable damage was done to the car, and the express messenger was killed. It was rumored that it was an attempt to blow up the bridge

TRAIN ROBBERIES have been plentiful of late. On the Wabash Western express, which left Kansas City at 8.20 P. M., Aug. 3, two men "held up" the passengers on the Pullman sleeping car in the rear of the train, and relieved them of about $175 in cash and two gold watches. Their plan to go through the remaining cars of the train was upset by the pluck of conductor JOHN ROACH. The express on the Forth Worth & Denver road was stopped in Oldham county in the Texas Panhandle at a point about 375 miles northwest of Fort Worth, by six masked men. The express and postal cars were broken open and about $2,000 was secured. The passengers were not molested. On Aug. 6 a train on the Denver & Rio Grande Western, near Crevasse, Col., was stopped by robbers. They were frustrated in their attempts to break into the express car and contented themselves with "taking up a collection" from the passengers, amounting to $900 and 20 watches.

On Aug. 8 a train robbery occurred on the Wisconsin Central train running between Chicago and St. Paul. About 3.30 A. M., while the train was between Chippewa Falls and Abbotsford, a man stepped into the Pullman sleeper and "held up" the conductor and porter, and relieved them and one or two passengers of their valuables, after which he pulled the bell-rope and jumped off as the train slowed up.

That four train robberies should occur in so short a time, when they have been so infrequent of late, is a curious coincidence. They seem, like great accidents, prone to come in a bunch.

THE SANTA FE AND ROCK ISLAND MANAGERS, as predicted in our issue of July 13, have concluded to fight the demand of the Chicago & Alton that Kansas City shall be the dividing point for east and west rates. They will make through rates over their own systems between points west of Kansas City and Chicago, less than the sum of the two locals ending at Kansas City. A rumor was circulated recently that the Alton proposed to purchase the Union Pacific's Kansas lines, but had probably no foundation in fact. Other cities have tried very hard to establish themselves permanently as a dividing point between eastern and western traffic but even Chicago, which has had greatest success in bringing all traffic east and west to her markets, has now such powerful competition on the north and south that through rates less than the sum of the locals will probably soon be permanently established between points west of Chicago and the seaboard. Kansas City has now three railway systems whose lines extend to the east and west. If she expects these to make all their rates for her especial benefit, she will be disappointed.

THE CHICAGO & ALTON COMPANY will have to defend before the Interstate Commerce Commission its action in making long-time contracts with Kansas City shippers, leasing cattle cars to the American Live Stock Commission Co., and carrying traffic between Kansas City and Chicago at less than its published rates. The charges are made by the Interstate Railway Association, and the Chicago, Rock Island & Pacific Railway Company.

It seems evident that the fight between the Alton and its competitors will be fought to a finish. The case promises to be one of the most interesting which has come before the Interstate Commission.

THE SOUTH FORK FISHING CLUB is made the defendant in a test suit brought in the Pennsylvania courts by the widow and children of a man drowned in the Johnstown flood. The damages are put at $50,000.

THE WEBB COMPOUND LOCOMOTIVE ,built for the Pennsylvania R. R. Co., by the London & Northwestern Railway Co., is now running on the Long Branch special. Since it was last in service, a regular American bell has been mounted upon it, as the gong previously used came near leading to several accidents.

A PLAN FOR THE NEW CRIMINAL COURT BUILDING for New York has been adopted. It is the one submitted by Messrs. Thom, Wilson & Scharsschmidt. It is to cost $1,400,000 and to be finished in two years. This building will be erected on the cleared lot bounded by Center, White, Elm, and Franklin Streets. The architects are to receive 2 per cent. for supervising the construction, instead of the usual commission of 5 per cent. The building will be fireproof and will be 115 ft. high.

A NEW GAS-PRODUCING PROCESS is reported from Springfield, Mass., as invented by Messrs. E. P. HOLLY and W. W. CASTLE. It is yet in the experimental stage, but as described is as follows: The idea is to volatalize oil, etc., by passing it in a spray mingled with steam through a coil of some resisting metal, heated to a great heat by the passage through the coil of an electric current. This coil is in a metal retort to which the oil is fed and sprayed by the steam. The chief advantage claimed is cheapness of production, 17 cts. per 1,000 cu. ft. being mentioned as the price. The gas is to be used for lighting, heating, smelting, etc.

CAISSON NO. 2 OF THE MEMPHIS BRIDGE has been successfully launched; it is intended for the mid-river pier. It is 50 ft. high by 92 ft. long and 47 ft. wide, says the Memphis *Avalanche*. Sinking is to be commenced about Sept. 1, by which time caisson No. 3 will be ready to launch. The expenditure so far on the bridge is set down as $250,000, and several hundred men have been employed there for some months past. Mr. A. NOBLE is the Chief Engineer for the bridge company.

THE RAINFALL OF July, 1889, along the Atlantic coast is one of the most remarkable on record for this country. In New York city it amounted to 9.52 ins. for the month, only twice exceeded by the 10.42 ins. of August, 1875, and 14.51 ins. of September, 1882. In Philadelphia the precipitation for the month was 8.29 ins., and the total rainfall up to Aug. 1 was 27.51 ins., an excess of 4.19 ins. above the normal fall, of which 4.09 ins. must be credited to July. Richmond, Va., seems to have been about the southern limit of this storm area, and had a July rainfall of 14.01 ins. and for the seven months of this year 52.11 ins., as compared with a normal annual rainfall of 38 ins. and 53.64 ins. for the wettest year on record. Baltimore had a fall of 45.13 ins. to Aug. 1, and 11.03 ins. for July, the wettest July on record. The excess above the normal rainfall was 19.7 ins. for the seven months. Washington, D. C., shows a similar excess of 17.5 ins. The same condition practically extended along the Atlantic coast line to Connecticut, where it commences to fall off. In Boston the rainfall was over 5.8 ins. for July, and the seven months show 22.63 ins., or 4.79 ins. below the average. Westward, Chicago alone shows an excess of moisture of 2.52 ins. Cincinnati has a deficiency of 9.41 ins., and Indianapolis of 4.11 ins.

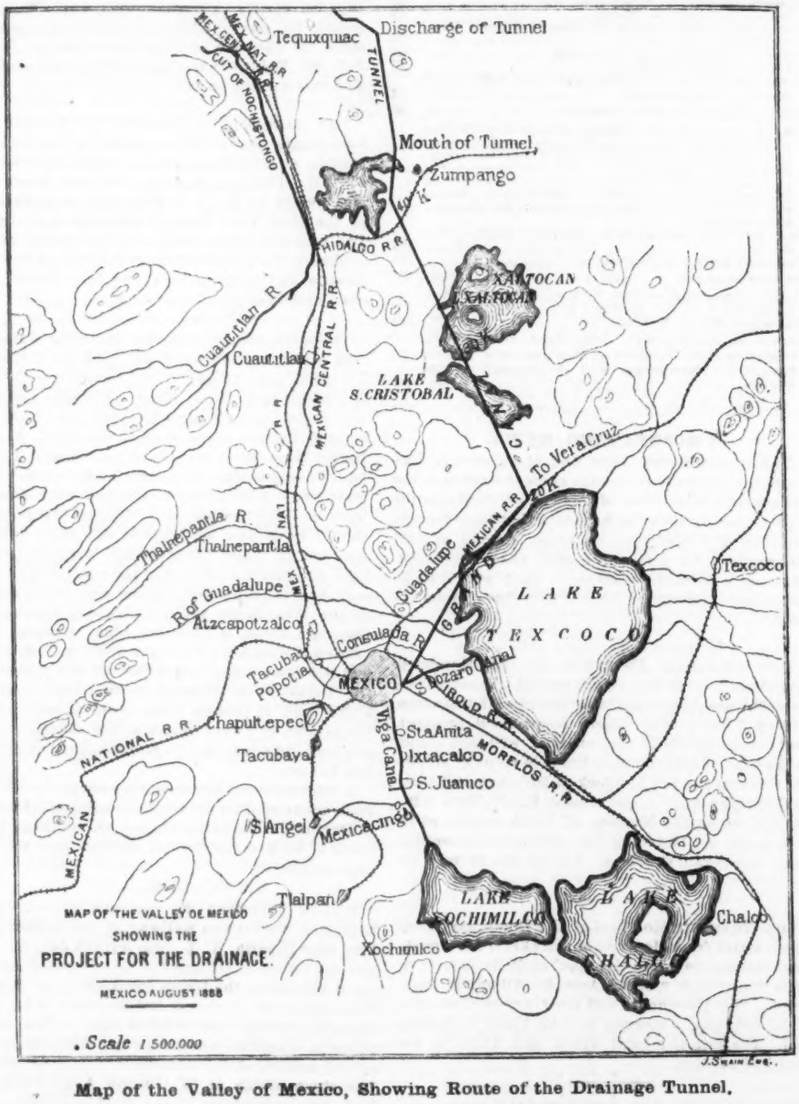
A JOINT FOR WATER AND GAS PIPES is described in *Dingler's Polytechnic Journal*, 1889, p. 346. It was used for water mains belonging to the South Austrian railways. The pipe ends were without sockets or flanges and the joint was made with tarred hemp as follows: The pipes were placed about 1-16 in. apart, to allow for expansion, and were then encircled by a sleeve of B-section, leaving two semicircular annular chambers around the pipes. A small hole was drilled near the end of each pipe and in each hole a tarred hemp rope was fastened and led out through holes in the collar. The collar was then turned by a key catching on projections on the collar, and the rope was thus wound around tightly until it entirely filled the spaces in the collar. The result is said to be a tight elastic joint that has conveyed water with good results and is claimed in one case to have stood a pressure of 10 atmospheres.

Drainage of the Mexico Valley.

The following account of wha is probably the most important enterprise now under way in Mexico, we take from a recent issue of *The Engineer*. The map showing the route of the drainage tunnel is taken from that journal, but the profile and cross section of the tunnel were obtained from other sources.

An important contract for a tunnel, having for its object the drainage of the valley and city of Mexico, has lately been let to Messrs. Read & Campbell, of London and Mexico city; and as the conditions and objects for which the work is being done are somewhat remarkable, we propose to give a short account of the works; and to render this the more intelligible it will be well, in the first instance, to describe the position and surroundings of the city. The Valley of Mexico is comprehended between 19 deg. and 20 deg. north latitude, and between 98 deg. 41 min. and 99 deg. 9 min. west longitude. The city of Mexico, in the centre of the valley, is in latitude 19 deg. 26 min. 5 sec. N., and in longitude 99 deg. 6 min. 45 sec. W. The valley is bounded on the north and west by the mountain chain of Paelmea and the smaller ranges that converge upon the Sierra of Tezonthalpan. To the southward the Cordilleras of Ajurco close in the valley, while to the eastward the Sierra Nevada complete the enclosure, which has no natural outlet. The highest mountains, which include the celebrated volcanoes of Popocatapetl and Ixtaccibuatl, some 17,000 ft. above sea level, are on the eastern side, while the peak of Ajurco, 13,000 ft., lies in the southern chain. The lowest point of the enclosure is directly north of the city of Mexico. At this point the hills are only 328 ft. higher than the lowest part of the valley, and it is here that the drainage tunnel will be made. The bottom of the valley is a nearly level plain of an oval shape, with its longest diameter from north to south, about 47 miles, and its shortest from east to west about 32 miles. The plain is interrupted by a few eminences, of which the Guadalupe hills, stretching into the centre of the valley from the west side, are the most notable. The average altitude of the valley is 7,412 ft. above sea level, and its area 1,657 sq. miles. The total area of the hydrographic surface of the valley, including the bottom, and the mountain sides that drain towards the interior, is about 2,711 sq. miles.

In the valley there are six lakes of considerable size, forming a crescent around the city of Mexico. Of these lakes, Chalco and Xochimilco are to the southeast of the city, Lake Texcoco to the eastward, San Cristobal and Xaltocan to the northeast, and Lake Zumpango to the north. Of these, Texcoco is the largest and amongst the shallowest, whilst Chalco and Xochimilco are the two deepest. There are four drainage planes in the valley;

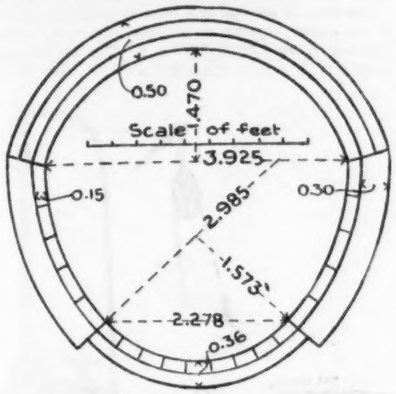


Map of the Valley of Mexico, Showing Route of the Drainage Tunnel.

the highest is Lake Zumpango, the next that of Xaltocan and San Cristobal, the third that of Chalco and Xochimilco, and the last and lowest is that of Texcoco, upon whose banks stands the city of Mexico. The latter would naturally receive the waters of all the rest but for certain restraints, natural and artificial, which prevent this and render the city safe. In former years Lake Zumpango was the point where danger of overflow was greatest, as it then received the waters of the river Cuautitlan, which drains a large extent of country. This river is now led through the Vertideros canal into the Tajo, or cut of Nochistongo. Thus this source of peril is removed. The waters of Zumpango, Chalco, and Xochimilco are derived from springs and clear brooks, and are fresh and drinkable. On the contrary, the waters of Lakes San Cristobal and Xaltocan, and still more Lake Texcoco, are salt and bitter to such extent as to be fatal to vegetation.

The rocks of which the mountain walls consist are ig-

neous, metamorphic, and sedimentary. In the Sierra Nevada the rocks are principally dolomites and lavas. Metamorphic rocks are found in the form of limestone on the northern side of the valley, and sedimentary formations in the level ground of the center. On the floor of the valley there is a succession of beds of clay, marl, sand, and gravel. When the Aztecs in their march south arrived at the site of the city, the vast lake that once

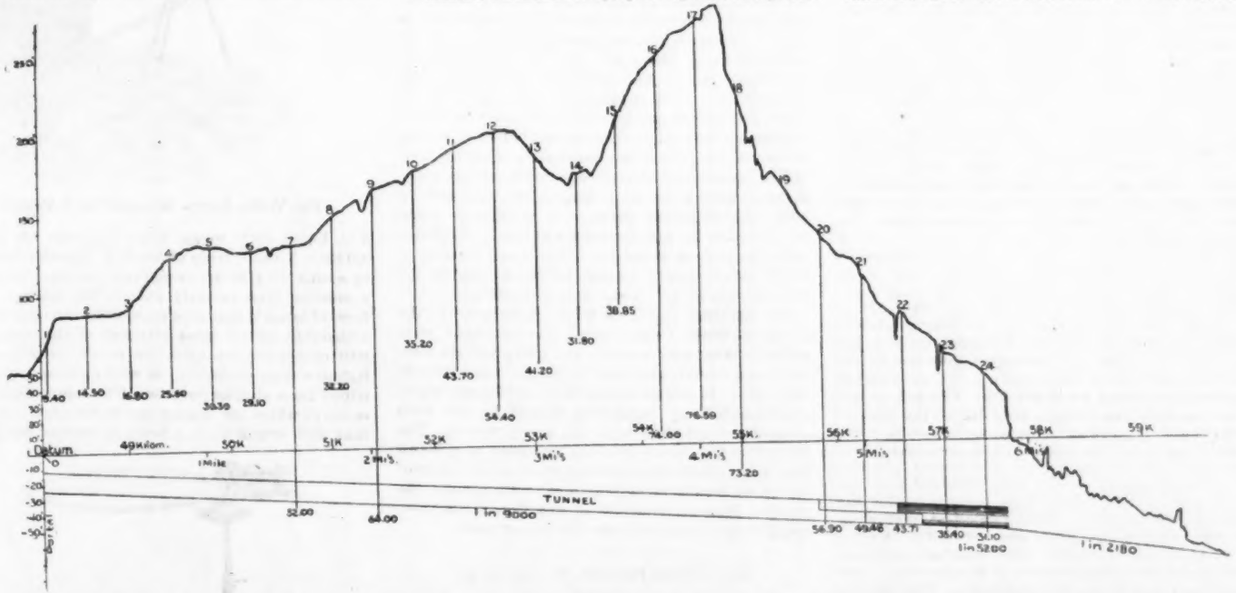


Cross-Section of Mexican Drainage Tunnel.

covered the whole valley had diminished in size, and had formed two lakes, a northern and a southern one. At the western part of the southern lake a ridge of unaltered rock emerged through the sedimentary rocks, and when the lake closed it area, nearly surrounded by water, at a higher level than the ground inside the city defences.

When the increasing area of dry land formed by natural and perhaps artificial means had encouraged the lake dwellers to cultivate and build houses, the pernicious effects of these annual inundations induced rude efforts to restrain the waters. The first record of these efforts, about 100 years before the Spanish conquest, relates how the King of Texcoco, by arrangement with the Emperor of Mexico, sent 30,000 Indians to build a dyke 8 miles long across Lake Texcoco to prevent the waters of Cuautitlan river from reaching the city. In the year 1604, a tunnel project was first considered, and in 1607 the Spanish engineer, Enrico Martinez, submitted to the viceroy a plan to drain the whole valley by a tunnel through the northern side. The work, however, was not carried out, but Lake Zumpango was drained and the river Cuautitlan regulated. In pursuance of this project, Martinez cut a tunnel through the mountain wall at the spot where is now the Nochistongo cut; this tunnel was not lined, and gave constant trouble from falling in. It was afterwards partially lined, when in 1629 there occurred the great inundation of Mexico, and the whole city was navigable by means of canoes; these floods lasted till 1634, when an earthquake released the waters. A few years after this it was decided to convert the tunnel of Martinez into an open cut; this colossal work took 150 years, and the completed work appears more like a natural ravine than the result of man's labors. It is 13 miles long and about 120 yards wide, and in some places is 200 ft. deep. After the completion of this great work nothing was done for many years, except as the fear of inundation compelled the ephemeral governments of the revolutionary period to cleanse the canals and repair the dykes. In 1856 a commission was appointed by the Government to select from a number of schemes which had been proposed by various engineers adopted for the work are entirely different from those recommended by him. The direction of the tunnel has also been changed. Leaving Lake Zumpango at the point he suggested, the tunnel diverges some 10 deg. to the east of Garay's line and emerges in the ravine of Acathan, instead of Ametlac. The effect of this change is to make the tunnel some 2 kilometres longer than is necessary, or 9-52 kilometres. Garay's tunnel would have been self-cleansing, whereas the canal leading away from the present tunnel, from its position, will require constant dredging.

Up to the present time about 1,300 m. of the northern part of the tunnel have been finished, and thus, after some 23 years—for the works were commenced in 1866—the tunnel is further from completion than if the Garay route had been adhered to from the first. The internal drainage of the city of Mexico consists of a network of covered gutters, which pass down through the middle or side of every street. The street drains are in a chronic state of choking up, which renders it necessary to frequently cleanse them. Any sewage that succeeds in traversing the drains gets at last to the subsidiary canals, and finally enters Lake Texcoco, when the latter is low enough. When the lake is high and no flow is possible, the sewage soaks into the ground under the streets and buildings. As this condition of things has prevailed for centuries, the state of the subsoil may be imagined. As the rains cause Lake Texcoco to rise, the city area is cut off from the lake by means of gates and dykes, and with the continuance of rainfall the sewers flow back and flood the principal streets, which are overflowed from wall to wall with black water. The flooded streets are traversed by innumerable vehicles, which fling showers of mud and water in all directions. Here and there little islands are seen, occupied by ladies in a state of consternation and dismay. Thousands of pounds' worth of goods are annually ruined by



Drainage Tunnel for the Valley of Mexico. Longitudinal Section Showing the Work Done on Shafts and Tunnel at the Time Construction was Resumed.

its pinnacles came near the surface of the lake, and around these a marshy island formed which became the site of the city of Mexico. One of these pinnacles is said to be the site of the Plaza of Santo Domingo; upon another pinnacle stands the present cathedral. The ridge of rock referred to extends in a southwest direction through the center of the city, and has been the principal cause of the formation of this land on which the city stands. At the time of the Spanish conquest, there was a shallow arm of the lake on the north and south of the city, but at the present time the western shore of Lake Texcoco is at a distance of more than two miles from the nearest part of the city.

The rainfall in this district is about 20 ins. annually; of this about one-third drains through the Cuautitlan river and the Nochistongo cut. Nearly half is used in irrigation, and the lakes finally receive about one-fifth of the whole rainfall of 787,000,000 cu. m. in the course of an average year. The average daily inflow to the lakes is about 2,250,000 cu. m. The area of the lakes being very large, the evaporation is generally sufficient to dispose of the daily inflow. The bulk of the yearly rainfall takes place between June and October; at this time the evaporation is quite unable to remove the extra volume of water then received by the lakes, and periodical inundations occur. During the rainy season the water is only kept from flooding the city by means of dykes. The city itself is for the drainage of the valley. The plan selected was that of Don Francesco Garay. Garay's plan provided for a tunnel to be driven through the northern side of the valley.

He also provided a system of irrigating ditches and navigable canals, to be supplied with water from Lake Zumpango. He proposed to drain Lake Texcoco entirely, and to reduce the other lakes to such dimensions as would remove all danger of their overflow. The tunnel was to commence on the northern shore of Lake Zumpango, and terminate in a ravine called Ametlac, and it was about 75 kilometres long. It would have been supposed that nothing now remained but to carry out the plans as adopted: such was not the case. There were more revolutions in the Government, and Garay's plans were lost sight of in the multitude of plans which were presented by different engineers, as they in turn were placed at the head of affairs by political changes. These plans varied greatly, and each engineer adopted a different basis for his calculations. The plan which found favor provided for the prevention of the rising of the lakes beyond a certain level, the idea of rendering dry any or all of them being abandoned. The assertion as to the danger to public health from the laying dry of Lake Texcoco is supported by the medical faculty of Mexico, but is not universally shared by engineers. The plan of Garay has been abandoned, and the dimensions these floods, and trade is sometimes brought to a standstill. During last year, long lines of wooden platforms were erected as gangways to enable people to avoid wading. The receding waters leave behind foul pools that have no outlets, and accumulations of reeking mud. The rainy season is thus one long period of infection, from which it is wonderful that any escape. In this condition, then, is the city of Mexico of to-day, but the present Government does not intend to let things so remain. The author of the project which is now being carried out proposes to control Lake Texcoco by securing therein so low a level that continued rain shall not raise it sufficiently to flood the city. The volume to be disposed of during the five rainy months is 190,000,000 cu. metres, requiring an approximate discharge by canal and tunnel of 15 cu. metres per second.

The canal is divided into two sections. The first part has one third only of the water capacity of the second part, as it has to carry only the water for the city itself, and it is not until the 20th kilometre is reached that the waters of Texcoco reach the canal. The second and larger part of the canal is 28 kilometres in length. The total length of the canal is 48 kilometres, or nearly thirty English miles, from the city to the mouth of the tunnel. The whole canal will have a grade of 1 in 5,000. The canal will be 6.36 metres deep at its commencement. The level of the city is about

the same as that of the ground at the commencement of the canal, except the western end, which is slightly higher. The excavated materials are to be tipped on each side of the canal at their natural slope, and a towpath near the canal level is to be provided. Sluice gates to control the drainage of the city, and direct it either to the canal or to Lake Texcoco, are to be provided near the city. A sluice gate will be provided at the junction of the smaller with the larger part of the canal, to control the flow of Lake Texcoco. At the entrance of the tunnel, another sluice will be provided. There are also river bridges and viaducts to provide. The most important part of the drainage works is the tunnel. It commences at the end of the canal and extends through the hills to a length which, as the present plans go, is 9,520 metres, but it is possible that the length may be extended to 10,000 metres to avoid a deep cutting. The fall is 1 in 1,060, and the total fall in the whole distance is 9.70 metres. The discharge end will therefore be 25.2 metres below the level of the main plaza of Mexico. The cross-section of the tunnel is semi-ovoid, and is calculated to give the required discharge of 17.5 cubic metres per second when full to the maximum height of flow at 3.9 metres above the bottom. There is a space 1.47 metres high above the water level to the curve of the circle. Sixty-five per cent. of sectional area is usefully employed for flow of water, whilst the remaining 35 per cent. is available only for floating bodies; and unless the tunnel is to be of use for navigation, it is not clear why gratings at the entrance could not have served the purpose as well. The velocity of flow is 2.30 metres per second. The arched part will be lined with brick, whilst the lower part will be lined with basalt building stone with an inside lining of artificial stone.

It was the intention of the late Emperor Maximilian—the ill-fated brother of the Emperor of Austria—to complete this work, and the country was surveyed with this intention, and the tunnel works were begun. Twenty-four shafts have been partially sunk, and some 1,000 metres of tunnel have been constructed during twenty years. The shafts are about 400 metres apart, and the deepest is about 300 ft. A large volume of water is met with, and to deal with this efficiently a bottom or drainage heading will first be run through. The tunnel will be driven both ways from each of the twenty-four shafts. The plant required is very extensive; 8 horse power and 10-horse power semi-fixed compound engines are being shipped for each shaft head for pumping and winding and ventilation. The tunnel will be lined throughout with brick made in the district, and the invert, as already mentioned, will consist of artificial stone. Ventilation will be by means of Root's blowers, driven by the same compound engines employed in pumping. The engines are by McLaren, of Leeds, and are on Halpin's system, consuming 2¼ lbs. of coal per indicated horse-power per hour. Coal has to be imported from the United States—a distance of 2,000 miles—its cost delivered at the workings being $12.50 per ton. The pumps will raise 150 galls. per minute; they are of the bucket-and plunger type, with hollow wrought-iron rods. About twenty million bricks will be used, and about thirty thousand 400 lb. barrels of Portland cement. Some ten thousand tons of lime obtained near the works and burnt in special kilns constructed for the work, will be required. Sand of excellent quality can be obtained at a distance of about six miles. Alwin's & Clayton and Howlett's brick-making machines will be used, of a total capacity of 60,000 per day. The Wells light will be used in the shafts. The lighting of the tunnel will be done by the contractors, considerable skill and care being required on account of the smallness of the shafts, which, having been begun, have to be continued the same size. English foremen, brick-layers, miners, and mechanics have been sent out specially for the work, but native Indians will be employed for general labor, the approximate number employed being about 2,500. Mr. ALBERT CAMPBELL, whose energy and hard work enabled a London syndicate to make a contract with the Corporation of the city of Mexico, and to raise the capital necessary for carrying out the works, is at present resident in Mexico and supervising the works, being ably assisted by Mr. MEARS, who has had a considerable previous experience of tunnel work. The contractors, Messrs. READ and CAMPBELL, are likewise constructing at the present time the Mexican Southern Railway, and a portion of the interoceanic railroad, and are carrying out several other important works for the improvement of the Republic of Mexico. The accompanying map shows clearly the features of the country passed through by the canal and tunnel, and also gives an idea of the necessity for the work for the safety and future welfare of the city of Mexico.

RAILROAD TAXATION in the North Dakota Convention has been settled by adopting the section providing that railroads shall be taxed at not less than a valuation of $3,000 nor more than $7,000 per mile.

The Future of Western Railways.

A reporter of the *Chicago Tribune* recently interviewed a number of prominent railway officials to discover their views concerning the probable future of the Western railway systems, and as to whether a railway trust was feasible. Among those interviewed were Presidents H. H. PORTER, of the Chicago & Eastern Illinois, MARVIN HUGHITT, of the Chicago & Northwestern, ROSWELL MILLER, of the Chicago, Milwaukee & St. Paul, and JOHN B. CARSON, of the Louisville, New Albany & Chicago; General Managers E. T. JEFFERY, of the Illinois Central, and E. P. RIPLEY, of the Chicago, Burlington & Quincy; and Chairmen GEO. R. BLANCHARD of the Central Traffic Association and ALDACE F. WALKER of the Interstate Railway Association.

The opinions expressed were remarkably uniform on most points. It was generally agreed that either a trust or a legalized pooling arrangement must be brought about very soon to avert general bankruptcy. Neither of these remedies was believed to be fraught with any danger to the public welfare, for either would be subject to government control and inspection as regards both rates and facilities. It was generally recognized that public opinion would not permit the formation of a trust at present, and either legalized pooling or the Interstate Railway Association were the only reliances to prevent disaster. If these failed, the time would soon come when roads now paying dividends would have to struggle hard to pay the interest on their bonds, while the weaker roads would become insolvent. The sudden fall in the value of securities would be such a shock to business confidence that it would probably bring about the greatest financial panic of modern times. The ultimate outcome, in case consolidation of management by the pool or the traffic association proved a failure, would be consolidation of ownership, either in the hands of a trust or in the hands of a few immensely wealthy men.

The possibilities of economy under a trust management were dwelt on at length. It was said by many that if all the roads west of Chicago could be operated by one management, good dividends could be paid on every one without any increase in traffic rates, simply because of the saving in the amount now spent on wasteful competition.

The greatest evil to be feared at present was the action of State Legislatures. The railways were asked to serve two masters, the State and the General Government, and they could not make rates to suit both. It was generally believed that the whole matter of railway legislation should be left with Congress rather than with the several States. The Interstate Commerce law was regarded as a necessity, but its inflexible working made it the source of injury as well as good to both the railways and the public. More legislation by the General Government, rather than less, was the urgent need.

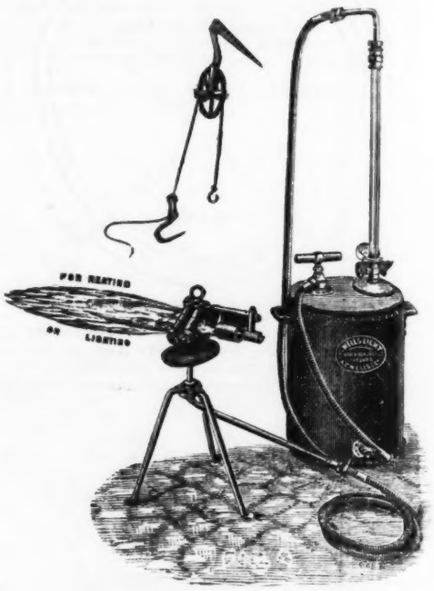
The Wells System of Lighting.

The system of lighting here described is already in extensive use in England, and is now being introduced into this country with a vigor which insures success. It is particularly well adapted for use on contract work wherever a large light is desirable, and is the only large artificial light used on the extensive workings of the Manchester ship canal.

Briefly described, this light apparatus consists of a tank made of the best steel boiler plate, that will stand any amount of hard usage. Into the crown of this tank, or lamp, is screwed a small hand pump, which is arranged to be easily removed for the renewal of leather washers, etc. Oil is pumped into the tank from a bucket through the short section of hose shown, and by the same pump the air in the tank is compressed to about 25 lbs. per sq. in. The burner is then heated by burning a little oily waste in the cup attached to it, and the valve being opened the oil is forced by the air pressure into the heated burner, is then converted into gas, and at once issues in a jet which when lighted burns in a large and powerful flame.

It can be safely recharged with oil or air without stopping the light, a feature which it is claimed belongs to this type of lamp alone, and sufficient in itself to commend it for many purposes. The lamp will burn tar oil, ordinary kerosene, or crude and refined petroleum mixed. Experiments made in Antwerp show that a light of 2,000 c. p. was maintained with a consumption of five pints of oil per hour. The tank was charged up to a pressure of 22 lbs., and burned down to 8 lbs., and burned 5½ hours; two or three minutes' work on the hand air-pump was then sufficient to charge it for another 5 hours burning. The flame was clear and steady.

The lamp is put up in a number of forms adapted to use under varying conditions, and with burners varying from 1,000 to 3,000 c. p. The tanks range from 1 ft. 3 ins. in diameter to 2 ft., and are all



The Wells Lamp, Mounted on a Tripod.

2 ft. high; they weigh complete from 120 lbs. to 200 lbs. A small lamp of 500 C. P. capacity supplied by a tank 10 x 16 ins., weighing complete 75 lbs., is a smaller type recently put on the market. One form of lamp is mounted on wheels; another has an adjustable swivel mast attached to the tank; and still others are arranged for masts for permanent lights in large yards, etc., or with mast and movable tripod for a similar purpose. The lamp illustrated is one in which the burner can be detached from the tank and swung up to a beam or lowered below the

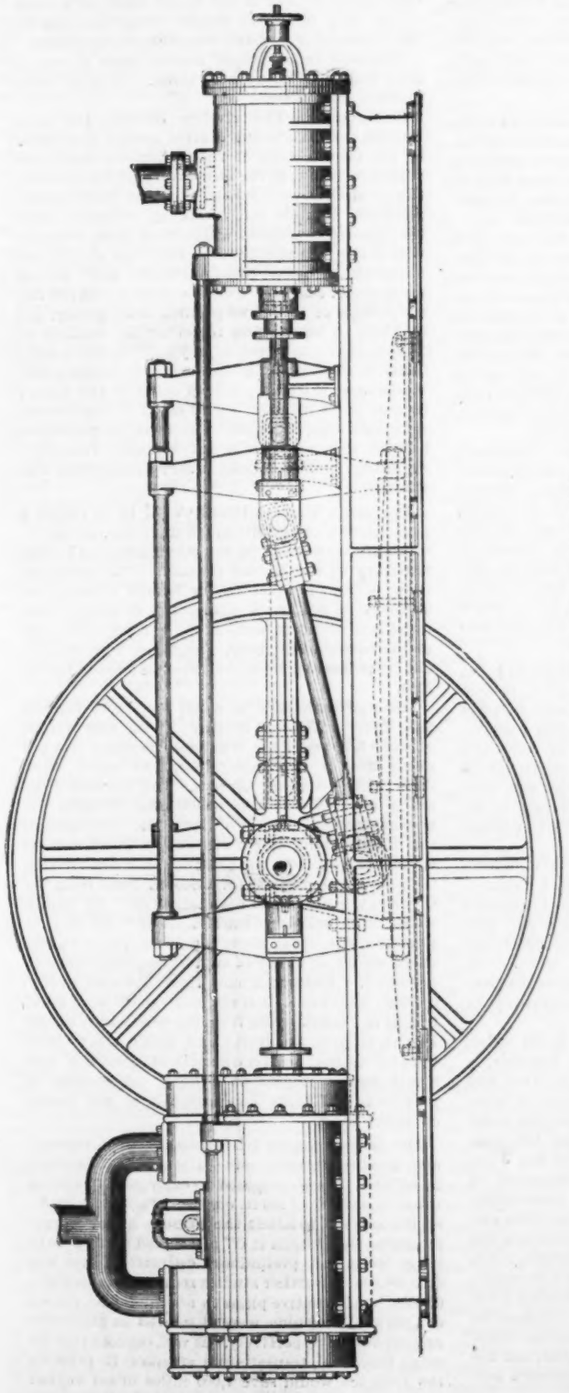
The Wells Lamp, on a Swivel Mast.

tank level. The American agents are Keegan & Halpin, 13 Murray St., New York, who will furnish any further information desired.

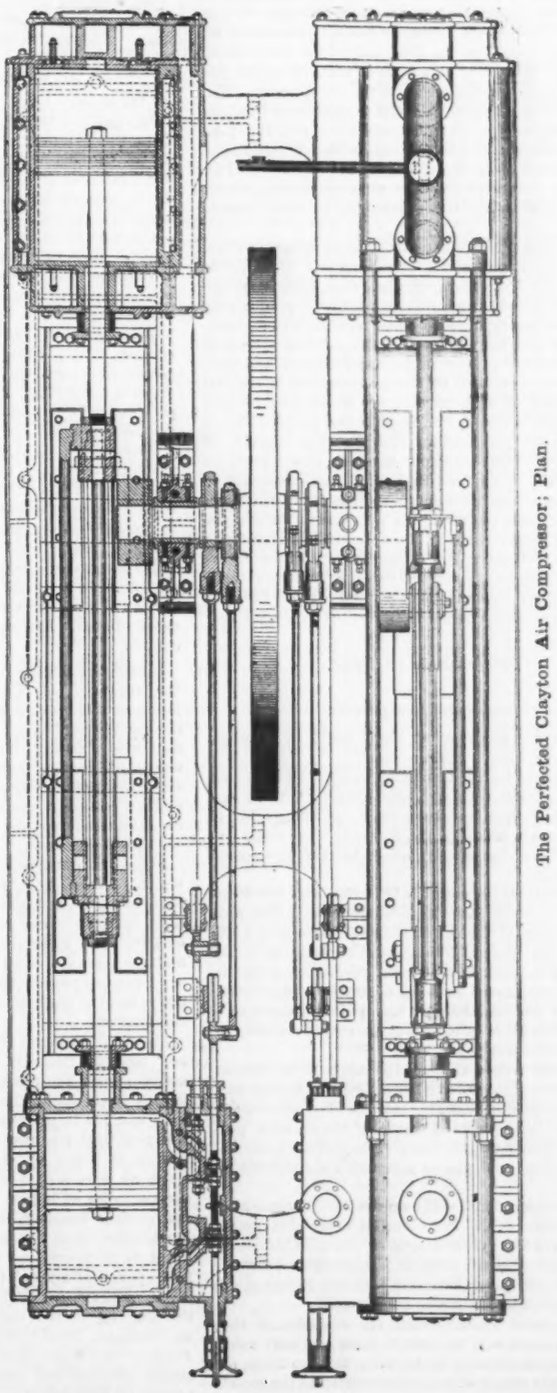
This lamp is in use on the terminal dock works for the Chignecto Ship Railway, in Nova Scotia, of which we shall give a further account shortly, and from personal observation we can testify to its excellent qualities for pushing out-door work at night.

The Perfected Clayton Air-Compressor.

Since 1873, when the first Clayton air-compressor was used in sinking the tracks for the Harlem Railroad, Mr. JAMES CLAYTON has been steadily improving and perfecting the details of the machine, and herewith is shown a plan and elevation of the compressor as now built for the market. The points of excellence aimed at are the furnishing of a given amount of air, at high or low pressure, at a minimum first cost, maximum efficiency; few repairs; and great accessibility of parts; and in attaining this end the inventor believes he has succeeded to an eminent degree.



The Perfected Clayton Air Compressor; Elevation.



The Perfected Clayton Air Compressor; Plan.

The following is a brief description of the important points of this compressor whereby the above desirable points are attained: First.—The patent connecting-rod arrangement, a combination of the slipper guide, vertical cross-heads and connecting-rod which admits of the placing of the latter between the steam and air cylinders, the tops of which are tied together with heavy brace rods, thus preventing the bed plate buckling with the strain of the compression, which comes in a direct line with the bed plate and the brace rods at the same time. By this arrangement a much stronger machine can be built with less gross weight and with a saving of considerable floor space over the compressors built with fly-wheel (or wheels) on the end of the machine. The fly-wheel is placed in the center of this compressor, thus obviating any danger of personal injury through coming in contact with it, and there is no necessity for removing it to get at any part of the steam or air cylinders. It will also be noticed that the shaft and air cylinders are not exposed to the heat of the steam cylinders.

Second.—The patent safety suction valves, the seats of which are firmly screwed into the heads, and the valves secured, by two nuts, safety stems and a spring cotter, from ever becoming loose and getting inside the cylinders. The "cages" for preventing the valves falling into the cylinder (common in other compressors) are dispensed with, the safety stems answering their purpose, and therefore the piston travels the full length of the cylinder, there being no lost space at either end of the stroke; the valve faces are protected by a slight elastic composition disc, which prevents any hammering and

consequent leakage. These discs can be renewed at any time at slight expense, and the valves and seats on the larger compressors can be inserted or removed from the outside by means of the tools furnished with the compressor.

Third.—The patent water jackets. The air cylinders are bolted to the bed plates in a line with the steam cylinders, but at the greatest distance from the heat thereof, and are surrounded by water jackets, the design of which is patented, and covers the only practical and efficient method of circulating water around an air cylinder, for cooling the air.

Fourth.—The patent combined speed and pressure governor, for controlling both the air pressure and the speed of the compressor, which operates by cutting off the steam when the desired pressure of air is attained, and turning it on again when the pressure becomes reduced: in addition to this, the speed governor regulates the speed of the compressor. This governor works perfectly and is guaranteed to control both the speed of the compressor and the pressure of air without any attention from the engineer. Besides the foregoing, there are other features of excellence embraced in these air compressors, which prove conclusively the superiority of their general design.

In addition to their use in sinking caissons, working pneumatic riveters, furnishing air to divers in submarine operations, working rock drills, coal cutters and underground hoisting and pumping machinery and charging automatic sprinklers, air-compressers are largely used in the aerated system of burning crude petroleum for fuel purposes, and have been very successful in the transmission of natural gas. Four of a large size are being used for this purpose at Rixford, Pa., forcing the gas a distance of 13 miles for heating and lighting the city of Bradford. They are also in use for a like purpose at Wellsville, N. Y. Two duplex gas compressors have just been constructed for compressing 2,000,000 cu. ft. of gas each, per day, to a pressure of 200 lbs. per sq. in. for the Kentucky Rock Gas Co., in supplying the city of Louisville. Engineers and others interested in compressed air, and desiring further details, should apply for a complete catalogue to the Clayton Air Compressor Works, 43 Dey St., New York city.

Ship Canals in 1889.

(*Concluded from page 102.*)

Canals in progress at home are 5 in number, with a total length of 191 miles.

The project for the Cape Cod Canal was broached a little over 200 years ago, and nearly 100 years ago complete surveys had been made for the work. It is only within a few years, however, that work has actually been commenced, and it has not progressed very rapidly.

The length of the canal is 7.6 miles, and the deepest cut is only 25 ft. to high-water level. The proposed section of the canal is 200 ft. wide and 23 ft. deep at low water. The amount of material to be excavated is about 18,000,000 cu. yds. and the cost is variously estimated at from $3,000,000 to $9,000,000. The time for construction was put at from 3 to 5 years. Two miles of the canal are stated recently to be finished to a depth of 15 ft.

This canal would shorten the route from Boston to parts south, from 70 to 140 miles, and the saving in time for sailing vessels is estimated at an average of 3 days. The expected traffic of the canal is put at 4,000,000 to 5,000,000 tons. The military advantages of the canal are as great as its commercial ones.

The Columbia canal will connect the Congaree and Broad Rivers, S. C. It is 5 miles long, 10 ft. deep, and 150 ft. wide. Over a mile of the canal, including the most difficult portion, is already completed. The canal will give Columbia and the Broad river a water outlet to the sea at Charleston.

The Cascades canal, around the cascades of the Columbia river, will be 3,000 ft. long and will have two locks, 462x80 and 90 ft. with 8 ft. to 24 ft. of water. This canal will give an outlet to the great plain of the Columbia, as yet almost entirely undeveloped.

The Harlem Canal, which is to connect the East and North rivers by way of Harlem river and Spuyten Duyvel creek, will be about 8 miles long 15 ft. deep, and 400 ft. wide. The history of this work dates back to 1874, when Gen. NEWTON made a survey for the canal. In 1879 Congress appropriated $400,000 for the work, and in 1887 proposals were advertised for, and the contract awarded in December of the same year. The work was commenced early in 1888, and is now in progress. The estimated cost is $2,700,000.

Nicaragua Canal.—The birth of the idea of a ship canal across the Central American Isthmus is practically coincident with the discovery of the New World, for it sprang into existence the moment it was proved that there was no natural strait connecting the two seas. But, though the project was frequently discussed, and numerous so-called reconnaissances made, there was nothing like an accurate survey of a route until within the present century. As soon as the Central American colonies threw off the Spanish rule and gained their independence, the Nicaragua route came prominently to the front.

In 1850-51, a thorough survey of a complete route from the Atlantic to the Pacific was made by Col. O. W. CHILDS, and plans and estimates presented for a canal 50 ft. wide at the bottom, from 78 ft. to 118 ft. wide at the surface, and 17 ft. deep, the estimated cost being a little less than $33,000,000.

Col. CHILDS' work is of interest as being the first survey made anywhere on the American isthmus which was really deserving of the name, all previous ones being wholly or in part based upon mere reconnaissance, estimate, or even hearsay. A commission which examined Col. CHILDS' plans came to the conclusion that a canal of the proposed dimensions would not meet the requirements of ocean-going vessels, nor could it see at that time sufficient prospective traffic to make the canal a financial success, and consequently the project was dropped.

When the U. S. Government in 1870-75 undertook, through the Navy Department, its comprehensive system of exploration of the American isthmus from Tehuantepec to the head waters of the Atrato, to determine the best route for a canal, the Nicaragua route was one of the first surveyed. Captain LULL, in command of the expedition, presented plans for a ship canal with a bottom width of 50 to 72 ft., a surface width of 106 to 165 ft., and a depth of 26 ft. Estimated cost a little less than $66,000,000.

In 1876 and 1880 Civil Engineer MENOCAL, U. S. N., the engineer of Capt. LULL'S survey, revised portions of the route, and in 1885 radically modified the eastern portion. In the spring of 1887 a concession was obtained from Nicaragua by American capitalists for the construction of a canal, and in the latter part of the same year a large and thoroughly equipped engineering force was sent to Nicaragua to thoroughly resurvey and definitely locate the line of the canal.

Plans and estimates for a canal with a bottom width of from 80 ft. to 120 ft., a surface width of 80 ft. to 340 ft., and a depth of 30 ft., based upon this final location, were prepared in the latter part of 1888. The estimated cost was about $66,000,000 and the time for completion 5 years. Last February Congress passed the bill incorporating the company, and the work of construction has already been commenced.

The total distance from sea to sea is 170 miles; less than 30 miles of this distance, however, is actual canal, the remainder being lake, river, and lagoon navigation. The summit level is 154 miles long and 110 ft. above the sea. There are six locks. The principal features of this canal are the creation of 64 miles of slack water in the San Juan river by means of a dam, and the formation of several miles of lagoon navigation by impounding the surface drainage by a series of earthen embankments. The estimated time of traversing the canal is 28 hours, and the estimated traffic, when first opened, at not less than 6,000,000 tons annually.

The magnitude of the benefits resulting from the opening of this canal it would be impossible to overstate. It will shorten the commercial water routes of the world from 1,200 to 6,000 miles, and the routes between our own eastern and western seaboards by 8,000 miles.

Exceptional as has been the success of the Suez and St. Mary's canals, the Nicaragua canal has all the favoring circumstances of both in an enhanced degree. The Suez canal opened a shorter route to comparatively fully developed countries, and its effect was simply to divert to itself, from longe routes, a traffic already existing. The St. Mary's canal is the only outlet of a region the development of which has been rendered possible by the canal itself. The Nicaragua canal will open up a direct route to regions which, although they already yield a traffic of 6,000,000 tons per annum, may be said to have just begun to develop, and the canal will not only divert this existing traffic to itself, but will *create* a business the proportions of which it is impossible to estimate. When the traffic of the St. Mary's canal climbs from 1,500,000 tons in 1881 to 4,500,000 tons in 1886, as the result of the development of the region about Lake Superior, some idea may be formed of the future traffic of a canal which will be to the Pacific Ocean what the St. Mary's canal is to Lake Superior, its only outlet.

Projected canals abroad number some 17, with a total length of about 2,000 miles. Five of these projects are English.

Birmingham.—The rivalry between the great English manufacturing centers, greatly intensified by the construction of the Manchester canal, will doubtless result, in the near future, in the construction of similar work for the benefit of Birmingham, Sheffield, Bristol, etc. Judging, however, from the numerous projects which have been advanced within the past two or three years for giving Birmingham a canal communication with almost everywhere, that city feels the rivalry and the disadvantages of its inland position most keenly, and is likely to be the first to follow the example of Manchester. The principal projects so far are: a barge canal to the Trent; a ship canal to London, estimated cost $5,000,000; a ship canal to the Mersey to cost $8,000,000; and a ship canal to the Severn, estimated cost, $6,250,000. The latter project seems now in a fair way to be put through. The outgoing traffic of Birmingham is stated at 2,000,000 tons annually.

The Great Western Canal would be in reality a prolongation of the Birmingham canal, in the interest of the commercial and manufacturing centers tributary to the Bristol channel. The projected route is from Stalford on the Bristol channel via Taunton to Seaton, a distance of 62 miles. The canal is to be 125 ft. wide at the surface, 36 ft. wide at the bottom, 21ft. deep. Estimated cost, $15,000,000. It will save a voyage of 300 miles around Land's End.

The Newcastle-on-Tyne canal project, to connect the Tyne with the Solway Firth, first talked of some fifty years ago, was again brought forward about five or six years since, and some work done in the way of surveys. The distance from sea to sea is 80 miles, of which some 12 miles are now navigable by vessels of large size. It is claimed the canal would offer a convenient short cut for ocean steamers from one coast to the other. Within the past year a project for a Scotch canal from the Clyde to the Forth has been talked of. Its length would be 35 miles and the rise 156 ft. There is at present a 9-ft. canal along the route, and it is said there would be no great engineering difficulties to overcome. Estimated cost from $7,500,000 to $10,000,000. This canal, it is claimed, would be of great benefit to vessels plying from the west coasts of the British Isles, to the North and Baltic seas; would open up the coal and oil districts of Scotland; and would possess important military advantages in permitting the rapid concentration of war vessels on either coast.

The project for an Irish canal between Galway and Dublin attracted some attention in England in 1883-84. It was proposed to enlarge the existing canal to a width of 100 ft. on the bottom and 200 ft. on the surface, to admit the passage of the largest steamers. The length is 127 miles, and there were to be 30 locks. A preliminary estimate of cost was $250,000,000. Further studies reduced this to $100,000,000. Alternative plans to accommodate vessels of 2,500 and 1,500 tons were estimated at $60,000,000 and $40,000,000 respectively. It was claimed that by using this canal, transatlantic steamers to ports on the Irish sea would save 1,000 miles of sea voyage and one day's time. A press comment upon the project at the time was that the "scheme is not much more visionary than the Manchester canal."

The Bay of Biscay-Mediterranean canal project, which comes up every now and then in France, would be practically an enlargement of the Languedoc canal. One of the proposed routes would follow

closely that of the present Languedoc canal from Bordeaux to Narbonne. The other starts on the Bay of Biscay at Arcachon, south of the mouth of the Gironde, and runs northeasterly to the valley of the Garonne and thence to Narbonne. The total distance is 267 miles. The canal will be 120 ft. to 147 ft. wide and 25 ft. to 27 ft. deep. The summit level will be 557 ft. above the sea, and the locks will have lifts of 30 ft. and over. The deepest cut will be 163 ft. The estimated cost is $130,000,000, and the canal would save a voyage of 700 miles around Spain.

The North-Sea-Mediterranean canal project is a most remarkable one. Like most other great enterprises of this character, its conception is not new, but dates back to the beginning of the Christian era. It seems to have first taken definite shape about ten years ago in a plan for a canal from Marseilles to Lyons, and thence to Dunkirk. A second route was from Marseilles to Lyons and thence to Paris and Rouen. The portion of this last route from Paris to the English channel seems likely to be constructed at a not distant date, a French company having offered within the year to execute the work, at its own expense, if it is granted a toll of 60 cts. per ton on all vessels entering the canal above Rouen. The proposed canal would be 20 ft. deep, and extend along the Seine from Rouen to Paris, 112 miles.

Brussels Canal.—The city of Brussels is agitating the project of deepening her present 10-ft. canal to the sea, built in 1836, to a depth of 21 ft. to 22 ft., to admit vessels of 2,500 to 3,000 tons, at an estimated cost of $4,000,000 to $6,000,000.

The Bruges canal, it is expected, will restore the old-time commercial prestige and importance of Bruges, which has been completely destroyed by the silting up of its communication with the sea. Its length will be 7½ miles, depth 23 ft., and estimated cost about $5,000,000.

The Paris-Boulogne canal is intended for vessels of 600 to 800 tons, depth 13 ft.

Surveys for an Italian canal, to extend from Fano on the Adriatic to near Castro on the Mediterranean, were made about a year ago. The length of the canal would be about 180 miles; the estimated cost is $100,000,000 and the time for completion 5 years. It is claimed that this canal would be of great value to the whole of southern Europe.

Baltic-Black-Sea Canal.—Within the past 5 or 6 years this project for a ship canal from the Danube near Vienna, through Moravia, Austrian and Prussian Silesia to the Oder near Breslau, has attracted considerable attention. The distance in an air line is 200 miles and the estimated cost of a canal capable of passing large war vessels is put at about $37,000,000. The project has been reported as entirely feasible and it is said that a preliminary credit for conducting the surveys has been applied for. It is claimed that the number of vessels using the canal would be three times as great as the number at Suez.

The Don-Volga or Black-Sea-Caspian canal will extend from Serepta on the Volga to Tzaritzine on the Don, a distance of 53 miles. It will pass vessels of 500 to 600 tons, and the estimated cost is $14,000,000 not including administration, discount, etc. The total excavation is about 35,000,000 cu. yds. and the deepest cut is 128 ft.

The Perekop canal will cut the Isthmus of Perekop, the link between the Crimea and the main land, and unite the Gulf of Perekop and the Sea of Azof. It will be 70 miles long and 12 ft. deep, and the estimated cost is $40,000,000. It is thought that it can be completed in 4 to 5 years, and it is claimed that it will shorten the voyage between Odessa and Sea of Azof ports 295 to 434 miles, and greatly benefit the salt, mineral, grain, and fuel producing districts of southeastern Russia. A company is said to be now prepared to build the canal.

The Jordan or Palestine canal project was quite prominent in England in 1883. It was proposed to cut a canal 25 miles long, from Acre on the Mediterranean to the valley of the Jordan north of Lake Tiberias, and a second one, 67 miles long, from the Gulf of Akabah to the south end of the Dead Sea valley, and then flood these valleys, forming a lake about 147 miles long and 10 miles wide. The total distance from sea to sea would be 240 miles, and the estimated cost was from $40,000,000 to $100,000,000. The origin of this project was entirely English, and it was undoubtedly only agitated for the purpose of obtaining better terms for English interests at Suez.

A very general project for a Syrio-Persian canal from the Mediterranean to the Persian Gulf, via Antioch, the Orontes, and Euphrates, Babylon, Bagdad, and the Tigris, was presented to the French Academy of Sciences in 1886-87. It was claimed this canal would shorten the Indo-European voyage 3 days.

The Isthmus of Malacca canal project was vigorously agitated by the French in Siam in 1882-83, and M. DE LESSEPS asked the King of Siam for a concession. The canal would connect the Bay of Bengal with the Gulf of Siam near Kraw. Its length would be 66 miles; the estimated cost is $20,000,000 and it is claimed it would save 500 miles of dangerous navigation on voyages from New York or Liverpool to China ports.

The Ceylon-Indian canal project contemplates a canal through the island of Ramisseram lying between Ceylon and India, by which it is said a sea voyage of 300 to 400 miles would be saved.

Projected canals at home number about 12.

Panama Canal.—The idea of a canal at Panama is of equal antiquity with that at Nicaragua. The two projects may be said to be twins. The first actual survey of the Panama line seems to have been made in 1828, but nothing came of it. In 1843-44 M. NAPOLEON GARELLA surveyed a line across the isthmus, and a French company was organized and preparations made to commence the work, but wars in Europe interfered, and the project fell through.

In 1875 a line was surveyed across the isthmus by Capt. LULL, under orders from the United States Navy Department, and plans and estimates made for a lock canal. In 1876-77 LIEUTS. WYSE and RECLUSE, of the French Navy, surveyed several lines, and in March, 1878, Lieut. WYSE obtained a concession from the Colombia Government. A company was then formed, with M. DE LESSEPS at its head, to construct the canal, and after the preliminary arrangements were completed, the formal inauguration took place in February, 1881.

Several plans for this canal were discussed, viz., with locks, with a tunnel, and a through cut, the last plan being finally adopted. The length of the canal is 47 miles, and the proposed depth 26 ft. The deepest cut is 386 ft., and the total amount of material to be removed was estimated at first at 46,000,000 c. m., later at 105,000,000 c. m., and still later at 151,000,000 c. m., which last is probably still below the mark.

The original estimated cost of the canal was $120,000,000, the time of completion 8 years, and it was expected that 6,000,000 tons of traffic would use the canal annually. Under the stimulus of M. DE LESSEPS' wonderful energy and great prestige, the stock of the company was rapidly taken; great quantities of plant and material were shipped to the isthmus: a magnificent "installation" was put in operation; and the work went merrily on. Almost at the outset, however, obstacles, which had been pointed out by prominent engineers, were encountered, and the work did not progress as rapidly as had been expected. Several additional issues of bonds were made without dampening the enthusiasm, until in 1886 many intelligent people, who had hitherto believed in the project, became doubtful as to its success. This feeling increased and became general among all classes in 1887, when it was shown conclusively that about $150,000,000 had already been expended and only one-fifth the amount of excavation completed, and that the company could now raise money only at a heavy discount. To meet this exigency the plans were changed "provisionally" to a lock canal with ten locks, to be gradually lowered to sea level after the canal was opened.

This change in plans very materially reduced the amount of work yet to be done, and was not without its effect in renewing confidence in the minds of some. This effect, however, soon wore off, and after a series of desperate financial moves to raise money last summer, among others a grand lottery scheme, the failure of the company to float an additional issue of bonds, even at a ruinous discount, gave the project its deathblow, and after numerous struggles it collapsed finally and completely during the past winter, with obligations amounting to over $450,000,000, and after having expended some $250,000,000 in cash. The total result of this expenditure is the removal of a cube of some 50,000,000 c. m. or about one-third the total amount. The laborers employed in the work have been sent home by their respective governments, and the Panama canal is a thing of the past.

As an engineering work it has not been especially interesting, as none of the real engineering problems connected with its completion have been touched. It is, however, interesting as showing the results of starting into a great project without sufficient or accurate information; and more particularly the blind infatuation with which the "ipse dixit" of a single successful man may be followed against all the facts and reasoning in the world. It may be taken for granted that this canal will never be completed.

Delaware-Chesapeake Canal.—During 1879-82 the Government surveyed three principal routes for a ship canal to connect Chesapeake and Delaware Bays, and since then the project has been more or less prominently before the public, and a company was formed to construct the canal, but as yet no work has been done.

Of the three routes surveyed, the one known as the Sassafras is the favorite. The length of the canal by this route is 30 miles, from bay to bay, of which distance 14 miles will be obtained by widening and deepening streams, and 16 miles will be through. The proposed section of the canal is bottom width 90 ft., surface width 171 ft., depth 27 ft. No locks except tide locks. The cost is variously estimated at from $6,500,000 to $11,500,000, and the time for completion 4 years.

The canal would save 215 miles between Baltimore and New York, and other eastern and European ports, and 286 miles between Baltimore and Philadelphia. It is anticipated that the canal would attract at least three-fourths of the tonnage of Baltimore, or between 5,000,000 and 10,000,000 tons. From a military point of view, this canal would be of great importance.

Niagara Falls Canal.—Several surveys and plans for a ship canal from Lake Erie to Lake Ontario have been made within the past thirty years, and two powerful causes push the project to the front every now and then:

1. The very natural desire to have a canal of our own between those lakes.

2. The fact that the Welland canal, with its 14 ft depth, is not deep enough to accommodate modern lake traffic, a fact which will be doubly emphasized when the improvements at St. Mary's and St. Clair have been completed, and a depth of 20 ft. obtained.

A recent project is for a canal 20 ft. deep to accommodate vessels of 3,000 tons. The length is about 25 miles, and the estimated cost $18,000,000. This canal seems more than likely to become an accomplished fact in the not distant future.

A Florida ship canal project has been more or less continuously agitated during the past ten years or more, and in 1883-84 it looked as if the work would be actually undertaken. A charter was obtained, a company organized, and surveys made; but nothing came of it.

Starting from the St. John's river, just above Jacksonville, the canal would cut across to the Suwanee river on the gulf coast. Its total length would be 137½ miles, the deepest cut 143 ft. for a short distance, and the proposed dimensions were, width 230 ft., depth 30 ft., sufficient to permit 3,000 ton vessels to pass without sidings. It was expected the canal would be completed in three years, and the estimated cost was $46,000,000.

The canal would enable vessels to avoid the navigation of the straits of Florida and would save in distance between New York and New Orleans 500 miles; New Orleans and Liverpool, 413 miles; New York and Pensacola, 600 miles.

Delaware-New-York Bay Canal.—This project contemplates enlarging the Delaware and Raritan canal sufficiently to permit its use by large vessels

This canal, with the Cape Cod canal, the cana from the Delaware to Chesapeake bay, and the Dismal Swamp and Florida canals, would form a grand inland system of navigation, which would offer an almost air line route to the coasting trade between Boston, New York, Philadelphia, Baltimore, Norfolk, the Carolina sounds, and Gulf of Mexico. Such a system could not be duplicated in either hemisphere nor its commercial and military importance be overestimated.

The military aspect of this project has recently been made the subject of a very instructive report by Admiral LUCE, U. S. N., in which he points out the facilities such a canal would offer for the rapid concentration of war vessels at any point for defense or offense, and the complete bar it would present to any effectual blockade of any of our great bays or ports.

Other home projects, including some in the earliest embryo stage, some of at present doubtful importance, and some in regard to which it has been impossible to learn much more than the name, are as follows:

The Lake Borgne canal, from Lake Borgne to the Mississippi river, length 12 miles, estimated cost $450,000, will, it is claimed, save the coast trade east of New Orleans a voyage of 265 miles.

The St.-Clair-Lake-Erie Canal would connect those two bodies of water through Canadian territory.

A Cincinnati-Lake-Erie Canal has two routes proposed, one from Cincinnati to Toledo, and one via Zanesville to Cleveland. A preliminary estimate of cost of enlarging present canals is about $28,000,000

Surveys for the Fresno-San-Joaquin River Canal are said to have been made, and the canal will enable steamers to run through from San Francisco. Estimated cost, $3,000,000.

The Lower Michigan Canal will extend from Saugatuck to Detroit, via the Kalamazoo river, a distance of about 178 miles. Its depth will be sufficient to pass vessels of 1,500 tons, and it will have six or eight locks. Estimated cost, about $5,500,000. This canal would give an almost air line route from Chicago to New York, and save several hundred miles in distance.

The Upper Michigan Canal will connect Bay Autrain, on Lake Superior, with Little Bay De Noquet on Lake Michigan. Its length is 36 miles; it would have two locks, and the estimated cost is about $5,000,000. This canal would reduce the voyage between Duluth and Chicago 271 miles, and if the Lake Superior trade increases during the next decade as it has during the past, the canal will be a necessity, and there will be ample business for both it and St. Mary's.

Regarded simply as engineering works, maritime canals may be divided into two great classes, those with locks and those without. A classification based upon the causes which lead to the inception and execution of such canals would be something as follows:

Commercial canals, originating in the demand of cities or regions unfavorably situated by nature for an outlet for their products, or in the struggle between rival cities or States for commercial precedence, or even existence, as the Manchester, St. Mary's, and Amsterdam canals.

Military canals, originating in a nation's military exigencies or ambitious, as the Holstein canal.

Inter-ocean canals, originating in the imperative demands of the world's commerce, as the Suez and Nicaragua canals.

Inter-ocean canals are the highest class. Aiding no one nation at the expense of another, they benefit every country that owns a ship. There are but two locations for such canals, one in each hemisphere, Suez and Nicaragua. One is completed, the other is in process of construction.

After making all allowance for the fashion set by the completion of the Suez canal, and the added impetus given by the commencement of work on the Panama canal eight years ago, to all kinds of projects for ship canals, many of which the recent catastrophe at Panama will cause to drop out of sight, we may rest assured that the ship canal has come to stay and to become a powerful commercial and political factor. The next few decades are sure to see wonderful results in this direction. The completion of the Nicaragua canal will leave no more worlds to conquer in the class of inter-ocean canals; but the impetus it will give to commerce in general, together with the already active tendency in the direction of maritime canals to give in land ports a direct and unobstructed communication with the sea, will probably for a time concentrate the activity in ship canal construction in works of that class. The completion of many of these, and the continued growth of ocean commerce and its ever-increasing demand for shorter routes, will then result in the construction of canals similar to the Corinth, Isthmus of Malacca, and Delaware-New-York Bay canals, until every sea and ocean route will have been reduced to its minimum length.

And it may not be a very wild flight to anticipate the time when every maritime nation of importance will have, as one of the most important adjuncts of military offense and defense, its ship canal for the rapid concentration of its huge floating fortresses at different parts of its coast.

Sewage Disposal at Milwaukee, Wis.

The commission appointed to prepare and present plans and estimates for the works for the collection and disposal of the sewage of Milwaukee, Wis., has sent on its report to the Mayor and Commissioners of Public Debt of that city, The engineers making this report were: Mr. G. H. BENZENBERG, City Engineer, JOSEPH P. DAVIS, of New York, and THOMAS J. WHITMAN and HENRY FLAD, of St. Louis, all well-known engineers.

The report is based on the present population of 210,000 and a city area of 10,175 acres, raised to 562,000 inhabitants, covering an area of over 15,000 acres in 1935; plans and estimates are made to provide for the latter quantities. The combined system of sewerage is in use with 106½ miles of sewers built. The city is divided by the Milwaukee and Menomonee rivers into three divisions, i. e., the Eastern Division of 1,300 acres, the Western with 4,328 acres, and the Southern with 2,100 acres. An intercepting sewer is now in operation in the Southern Division, but all the other divisions are drained into three streams, the two named and the Kinnickinnic river. The summer flow in these streams is quite small.

The amount of sewage daily emptied into these streams is about 20,000,000 galls. To prevent a nuisance arising from this sewage in summer, a flushing tunnel has been lately constructed, through which about 400,000 galls. of cool lake water can be delivered daily into the Milwaukee river about one mile south of the northern limit of the city. The beneficial results from this flushing are extended to the Menomonee river, which is cleared by a current of diluted Milwaukee river water passing up this stream and then into the intercepting sewer, the flow being maintained in the latter by pumps which discharge the sewer water into the lake.

The commission discusses the question of disposal exhaustively, and finally recommend the following method of disposal: Intercepting sewers are to carry the bulk of the sewage to a central station, wherein it is to be raised by pumps 35 or 40 ft. into a large outfall sewer, which will discharge by gravity into the lake three miles south of the present city line. The sewage from the high ground will be delivered directly into the outfall sewer without pumping. The total amount of sewage (including $\frac{1}{12}$ of one cubic foot of rainfall per acre per second) estimated as delivered to the outfall sewer is 364 cu. ft. per second. About one-half of this comes from the high-grade intercepting sewers; the other half, or 119,800,000 galls. in 24 hours, must be pumped.

At the lake end of the outfall sewer a terminal basin is to be built, and from it two 56-in. iron pipes will lead out into the lake as a discharge. One of these pipes will be laid at right angles to the shore and be about 6,000 ft. long, the other will run to the south-east and be about 8,000 ft. long. The outer ends of the pipes will be in about 30 ft. of water and will be 5,000 ft. apart. The discharge from these pipes will be from 11 branch connections about 300 ft. apart, so as to dilute the sewage as rapidly as possible. These branches will be 17 ins. in diameter, and reduced so that the same quantity of sewage will be discharged by each. The branches would be vertical, and the lake end of the main pipe would for 1,000 ft. be raised on piles 6 ft. above the bed of the lake.

The formula used in estimating the quantity of sewage to be provided for by the intercepting sewers, and in determining their size, is given as follows:

$$Q = \left[\frac{A}{100} + 0.000243\ P\right] \text{ and}$$

$$D = \frac{0.2753\ (1.25\ Q^{\frac{3}{4}})}{I^{\frac{1}{16}}}$$

in which

Q = Number of cubic feet per second.
A = Number of acres in area drained.
P = Number of inhabitants living in area drained.
D = Diameter of sewer in feet.
I = Rate of inclination, or fall in feet, for any given length, divided by length in feet.

The report then describes and locates the various intercepting sewers. Tabulated the cost would stand as follows:

Intercepting, low and high level sewers		$1,709,700.78
Pumping plant, including		
3 engines at $65,000 each	$200,000.00	
3 pipe lines of 2 650 ft. each	132,500.00	
Engine foundations	82,944.80	
Straining chamber	10,555.00	
Pipe chamber at outfall sewer	2,694.06	
Buildings	61,735.85	
Outfall sewer, etc		$680,379.71
29,000 ft. of sewer at $35	$1,016,050.00	
Discharge pipe, 14,000 ft. at $25	350,000.00	
Terminal chamber	12,500.00	
Becker St. intercepting sewer	28,420.00	
		$1,406,970.00
		$3,797,050.49
Add Bay View low level sewer		46,500.00
Land damages		75,000.00
Total		$3,918,550.49

The diameter of the intercepting sewers would vary from 3 to 8½ ft. The outfall sewer would be all tunnel work (28,000 ft.) and be 10½ ft. in diameter. The pumps would each have a capacity of 25,000,000 galls. in 24 hours.

The same report includes plans for the extension of the Milwaukee water-works. The present daily consumption is 22,000,000 galls., about 100 galls. per head. The new plans are based upon a consumption of 65,000,000 galls. daily in 1935. To obtain this additional supply requires a new pumping station and a new conduit from the lake. The pipe now in use as an intake is of insufficient capacity and its location is objectionable. The new point suggested is in Whitefish bay, 5 miles above the outlet of the Milwaukee river. The experts believe that all danger from sewage contamination will be removed if the intake is located 4,000 ft. from shore in water 50 ft. deep. They estimate the cost of complete works at this point, covering intake, 4,000 ft. of conduit, engines, engine house, and force mains to present reservoir, at $2,333,400.

The present intake is at North Point. Tunneling for a conduit is impracticable here or at Whitefish bay, and iron pipes are necessarily used. After discussing the effect of sewage contamination, the experts recommend the location of the new works at North Point, as being practically equally safe with the other and as costing only $1,166,550 complete.

The report contains an amount of valuable matter in the form of appendices and an excellent map of Milwaukee.

THE COMET DISCOVERED BY BARNARD last September is thus referred to by Prof. EDWARD S. HOLDEN, Director of Lick observatory. He says: "The comet has now lost all of its tail. The comet was subject to immense strain and stress in passing that part of its orbit nearest the sun, and it is now showing the effect of these forces in the following way: Its body is evidently becoming disintegrated, and fragments are seen to be streaming behind the comet in the form of a tail, directed not from, but toward, the sun. This mass of matter was measured by BARNARD on July 16, and his measures show that its least possible length is 430,000 miles, and its least possible diameter is 144,000 miles, so that fragments which have already broken off from this comet amount to at least seventy quadrillion cubic miles. The comet itself, which is 165,000,000 miles from the earth, is still fairly bright, and were it not for the fragments which are seen to follow, it would seem to be in perfect normal condition. As it is, we know it must have lost an immense quantity of original substance. This is an interesting case to astronomers, as it shows the effect of the enormous forces to which every comet is subject at the time of its perehelion passage, while the phenomenon forms an interesting commentary upon the text that comets, even the stoutest of them, must be short-lived things."

THE ELIAS TEREDO-PROOF PILE CO., of San Francisco, proposes to cover the piles before driving by a steel jacket, rendered rust-proof by the Bower Barff process. The capital stock of the company is $1,000,000.

Electric Railways in Boston.

The adoption of electric motive power, which has just been authorized by the stockholders of the West End Street Railway Co., of Boston, for the entire system of this great company, marks an epoch in the progress towards the rapid transit demanded for city and suburban populations.

Of the necessary steps towards making what will undoubtedly prove a revolution in more respects than one, there now remains only the application for permission from the Board of Railroad Commissioners of Massachusetts and the proper financial arrangements for the raising and expending of the large amount of capital required to make the change from horse to electric motive power throughout.

The cost of the 230 miles of tracks comprising this system, as charged on the books of the company, is $4,391,940, and the company now expects, in making this change, to issue $4,500,000 of new stock, or an amount equal to the entire cost of the present tracks, the present total investment, comprising the tracks, real estate, cars, horses, and general equipments, being $11,619,172. Of this sum $1,500,000 to $2,000,000 will be required for motors; about $1,000,000 for the power plant of 10,000 horse power; $1,000,000 for poles, wiring, etc.: and $4,000,000 for new construction, equipments, and new tracklaying involved in the change.

In explaining the situation to the stockholders President Whitney made some interesting statements. He finds that the normal increase of travel on the horse railway system in Boston is approximately 10 per cent. yearly. Two lines, one from Bowdoin Sq. to Harvard Sq., Cambridge, with an extension of 4 miles to Arlington, and one from Park Sq. over the Back Bay District, through Brookline to Chestnut Hill reservoir, amounting to some 30 miles of track, have been in operation, with electric power on the overhead wire system, a sufficient time to enable a comparison to be made with operation by horses. Indeed, Boston already operates more miles of track by electric power than any other city in the country.

The first thing that has been found is that on the Arlington line, which has been in operation about three weeks, the receipts for the same number of days were, last year, with horses, $2,721, and with electric cars, $6,273, or an absolute increase every day of running of 150 per cent. On the Brighton line, the receipts for the month of June, last year, were $4,426, and the total receipts for June, this year, were $8,759, or 100 per cent. increase. This experience could not have been anticipated. At a conservative estimate, it is expected that the advantages and facilities afforded by electric power over horse power will cause an immediate increase of travel of from 30 to 40 per cent. The gross earnings of the company from Jan. 1 to June 30, 1889, were $2,515,136; for the same period last year, $2,309,367, or an increase of $205,769.

The experience thus far obtained as to cost of operation is as follows: The average cost of motive power by the horses, for the last six months, is $10.16 cents per mile. This does not include the expense of drivers, conductors, starters, track repairers, or any items except those directly chargeable to motive power. With the electric power, the cost of fuel does not exceed 1½ cents per mile. Including engineering, which is proportionately a heavy expense on short lines, the total cost of operation on the Allston line (Arlington) is 3 cents per mile, and it is estimated will be in future not more than 2½ cents per mile. The taking care of the motors and the maintenance expenses of the overhead line is costin about 2½ cents per mile additional, making the total cost of operating with electric power 5 cents per mile, showing a clear saving over horse power of 5 cents per mile, or 50 per cent.

The plant of the West End Railway comprises 776 cars, worth 763,000, and 7,135 horses in operation, worth $956,090. New cars were purchased to the number of 225 during the last 9 months, to meet the ordinary increase of travel, and horses were bought in the fall to the number of 1,350, of which 1,035 were sold in the spring, 168 horses being lost by death.

The introduction of the new system must necessarily be done somewhat gradually. All the motive power, cars, stables, and land now occupied will be still needed, and if electricity were employed on only the increased facilities required, the change would be made with considerable rapidity. It is proposed to make the site and buildings of the recently acquired property of the Hinkley Locomotive Works the single great power station for all the lines inside the Charles river, including the city proper, Back Bay, South Boston, South End, Dorchester, and Roxbury suburbs. A similar station may sometime be required in Cambridge for the remaining lines. It is expected that these provisions will meet Boston's needs for 25 years to come.

As to speed, 12 miles per hour is now the average with the electric motor, including many stops; this is actually more than the average speed now existing on the New York elevated railroads, which is but 10.89 miles per hour. On a recent trial trip, a mile was run by an electric car in 3 minutes. On suburban lines, outside the city's center, 15 miles per hour can be regularly maintained. Even these moderate increments of speed over that obtained under the old conditions means great relief and important advantages to the traveling public: time is saved, business men are enabled to live farther from the city's center, in more comfortable homes and for less cost than before. Real estate, which before was comparatively useless, will be occupied and will rise in value. A great stimulus to growth will take place in all the suburbs, and extend to the city itself, wherever the transit shall be quick and least obstructed.

The repairs and renewals of this company for 9 months amount to $194,202, or sufficient to build about 20 miles of entirely new track. The operating expenses are about $20,000 per month. Now, in making the change, all parts of the present system will not need renewing at once. Perhaps 50 or 75 miles of the track, where the higher speeds can be obtained, will require relaying with heavier and a better form of rail. The 30 miles already in operation displaces and supersedes about 300 horses. The new motor has the power of 30 horses, and can readily draw two cars besides itself, thus increasing the capacity of the present cars three times whenever required. The sanitary advantage of removing some 6,000 horses from the streets should also not be overlooked. Some of the important advantages which will follow, in the future, the introduction of the electric motor are indicated above; and if successful in one city, the effect of its general introduction in all the larger cities of the country can scarcely be anticipated. If, as has been estimated, $1,000,000,000 is to be expended in this direction, new fields of employment will be opened to engineers and thousands of working men, industries of supply will be started, and great business enterprises established to manufacture the rails, boilers, engines, dynamos, cars, brakes, and tools required. There seems to be no more promising field to-day for a young engineer or business man to enter than that indicated above. To be successful in this world, one must follow the lines of progress, and do what is most useful to the many, and as and when the time comes that it is wanted.

THE AMOUNT OF WATER consumed by horses and cattle is not usually taken into account in estimating the supply needed for a town. In a recent German work by LUDWIG TIEFENBACHER on the hydraulics of streams, the following statement, however, is made: "The average water consumption in cities is generally taken as 60 litres per person per day for house use only, and during the summer months is 25 per cent. greater. Since this is delivered in about 16 hours, it is well to provide for double the average consumption. The following figures may also be employed in estimating the quantity used outside the houses: 50 to 70 litres per day for one horse, 40 to 60 litres for one ox or cow, 20 to 30 litres for one heifer, 3 to 5 litres for one sheep, and 10 to 20 litres for one hog."

Some of the Problems to be Discussed by a Rapid Transit Commission.

The engineer whose paper on transit in the city of New York we published in our issue of July 27 writes us to say that he neglected mention of a deep tunnel as a method of construction for rapid transit railways, not because he had not considered the subject, but because he had considered it, and deemed it out of the race. He asks us to give place to the following notes, intended to present further details of his scheme, so that it may be thoroughly understood, and may evoke the criticism which he desires.

A tunnel near the surface, even if costing more than a deep tunnel, would be more satisfactory to the public, and the more remunerative of the two methods of construction.

It is not to be assumed that the deep tunnel could be constructed the more cheaply. The tunnel near the surface will encounter considerable obstacles only in crossing the transverse streets. Through the blocks, there are no gas or water mains or sewers to be maintained; and where cellars and vaults exist, much of the excavation needed is already made.

Ventilation would be effected through air shafts in the centers of the blocks, averaging, perhaps, 300 ft. apart. These shafts, and the disturbance of the air by the moving trains, may suffice to keep it pure.

If the station platforms are so far from the surface that elevators must be used, four will be needed for each platform, if the service is to be as efficient as it is in the high office buildings. Given 82 stations, having 164 platforms, 656 elevators, of abnormal size, would be required. It might cost as much to maintain and operate these elevators as to run the trains. But whatever the cost may be, it can be saved by locating the station platforms near the surface.

It is intended to lay the grade line at stations as high as possible. The total rise of the stairways may be 12 ft., somewhat less than would be necessary in the case of an elevated way.

The run of the local trains consisting of a series of spurts, of some sixty seconds each, from start to stop, it might be well to locate the station platforms on summits.

The coaches might perhaps be built with mirrors, ground glass, and painted panels, in place of the usual car windows, ventilators being placed above and below.

The stations and the interiors of the trains, but not the whole tunnel, would be brilliantly lighted, and in cold weather comfortably heated. Riding in the tunnel trains might be like car travel by night through a forest. "Look in, not out."

The 12 ft. wide platforms would have seats along the outer edges. The inter-track platforms, if made some 25 ft. wide, might have seats at the centre There would be toilet rooms, but no waiting rooms other than the platforms.

In the rectangular part of the city, the east-side rapid transit line would be located a short distance west of Third avenue, and the west-side line a short distance east of Eighth avenue, below Fifty-ninth street; above there, near Ninth avenue.

On cold, stormy, and very warm days—perhaps more than half the time—the entrances, platforms, and trains of the tunnel would be more comfortable than those of an elevated way. Any one who has lived in the coal regions, where the temperature in the mines is nearly uniform, and feels to persons entering in winter pleasantly warm, and in summer pleasantly cool, must have noticed that men who have once been employed under ground generally prefer to work there at all seasons of the year rather than outside. The commonly expressed belief that the public would, on the general average, find travel on an elevated way more agreeable than travel in a tunnel is not, perhaps, justified by fact.

Between the rapid transit tracks would be channels (some 3 ft. wide and 4 ft. deep) in which the track inspectors would walk, out of the way of the trains, and having the rails conveniently handhigh.

The trains would run entirely under cover. The immense car houses required might be constructed under ground, without greatly impairing the value of the superincumbent land.

If practicable, cable-traction would seem to be the best motive power for rapid transit railways; because the trains would move at uniform speed, up and down grade, and thus keep well spaced. Doubtless it might be worth while to take a slate and pencil, and figure a little on the possibilities—a cable running at the speed of 50 miles an hour, to move an endless succession of trains (each weighing some 300,000 lbs.), following one another at short intervals, and stopping, on one set of tracks, three times in a mile, and on the other, once in two or

three miles, all on a line with grades galore. Who has a sharp pencil? Don't all speak at once.

The city, even if not the builder of the transit system, is likely to profit immensely from its favorable effect on land values; and might, therefore, afford to hold out a helping hand. Were the city to condemn and pay for all the right of way needed through the blocks, and give free occupancy to a transit company that would construct the specified roads, and operate them in a manner provided, the building sites over the tunnel, although in most cases having no basements, and being slightly diminished in area by the space required for air shafts and station entrances, might increase in value, owing to the operation of the transit system, sufficiently to produce a paying revenue from ground rents. Thus, by a remunerative investment, might the city start in life, and stimulate to lusty growth, the yet unborn transit infant.

It would produce an efficient transit system to retain all that part of the specification relating to cross-town lines, location and dimensions of station platforms, and methods of operation; and then, instead of constructing a tunnel, to tear away the Third, and the Sixth Avenue elevated roads, and having changed the location where corners are turned, by purchasing such right of way as will enable the taking out of all sharp curvature, to replace these roads with a four-track belt structure, 31 miles long, and strong enough to carry the given trains at the required speed. The cost of providing and equipping the cross-town lines and new elevated ways would hardly fall short of $60,000,000. It is difficult to determine whether public interest would warrant the making of such a proposition to the elevated railway owners, and impossible for any one now to say whether they would accept it. But certainly, no change in the elevated railway system should be permitted except upon plans made by disinterested experts in bridge engineering. Possibly by using deck spans, three to the block, with iron cross ties, the obstruction of the streets, and interference with light and air, might be even less than is the case with the present two-track structure. The cross-town feeders would render possible the abandonment of the Second Avenue elevated road; and if the new west side line were built in Eighth Avenue, the Ninth Avenue road could also be abandoned. The Sixth Avenue elevated way might then continue operating to 59th street; but this road could not be connected with the new lines without cutting down their capacity and speed; and distinct car houses should, therefore, be provided. Trains cannot, probably, follow each other at intervals of a minute or a minute and a half, make nine stops, and run the whole length of the city in half an hour, except on an unbroken track. A drawbridge would mean confusion. The new lines should therefore cross the Harlem river in tunnels, or at an over-all elevation. Here might be a chance for a bold engineering feat.

New York is a city in which the public is influenced more by men than by ideas. If any man of great prominence were to say that the true solution of the transit problem is by means of a canal and gondolas in Broadway, he, doubtless, would have a large following; and were any such man to express a strong determination to see the transit question treated on its merits, the thing would, probably, be done. Several well-known men to whom this view of the case was submitted by the writer, replied that they "hadn't time."

If expert commissioners, to report a plan for revising and adding to the city's transit system, are appointed by a legislative bill, the bill should not also provide for any work of permanent organization or construction. Until the plan is fixed upon, and it is settled whether the city is to have any interest in the work, or whether it is to be undertaken by the owners of the elevated roads, or by a new transit company, no one can tell exactly what legislation is needed. Let us make haste slowly, and not attempt to cross streams before we come to them.

NEW YORK, July 30, 1889.

Railway Schemes in the Northwest.

It was our intention to include on our map and list in last week's issue only such enterprises as have either some work in surveying or construction now in progress or seem to have a fair prospect of doing some work before many months. As we explained editorially, this necessitated the exclusion of the schemes of many independent companies whose officers still profess faith in their ultimate success, though they have no intention of spending more time or money in pushing their enterprise until conditions are more favorable for securing capital. There are also many projects for extensions of existing roads, which have something to recommend them, and which, as feeders to main lines, or as outlets to reach new and important centers, have some promise of profit. But these too will be held in abeyance until the return of confidence in railway investments makes it possible to secure capital for construction.

We have selected the most important enterprises of these two classes to make up the following list. If the promotors of any enterprise consider that we have rated its prospects too low, we shall be pleased to receive from them any further statement concerning the finances or the inherent advantages of the enterprise which they may see fit to make.

It is quite possible, indeed, that some of the schemes in the following list may reach success before some of those included in our last week's list: on the whole, however, we believe that the chances for the early resumption of work on any of them are very small, for in the Northwest this year even the projected extensions which have the best backing move forward very slowly.

With each independent enterprise we have given the name of one or more of its chief promotors.

ILLINOIS.

Chicago, Freeport & Sioux City.—Projected, Freeport to Sioux City, Ia., about 350 miles. Abram L. Brink, Warren, Ill.

Chicago, Milwaukee & St. Paul.—Projected, Evanston to Highwood, 15 miles.

Jacksonville, Southeastern.—Right-of-way secured, Driver's to Benton 23 miles.

Milwaukee & Peoria.—Proposed, Milwaukee Wis., to Peoria, Ill., about 200 miles. C. O. Haslett, Phœnix Building, Chicago, Secretary.

Ohio & Mississippi.—Proposed, Beardstown to Keokuk, Ia., 60 miles; Shawneetown to Paducah, Ky., about 50 miles.

Paducah & Mt. Vernon.—Surveyed, Paducah, Ky., to Cypress Jc., Ill., 66 miles. Projected, Cypress Jc., to Mt. Vernon, Ind., 44 miles. Amasa Mason, 502 Bedford, Ave., Brooklyn, N. Y., General Manager; E. C. Rice, St. Louis, Mo., Chief Engineer.

St. Louis, Alton & Springfield.—Calhoun & Northern.—Surveyed. Grafton north, 50 miles.

St. Louis & Chicago.—Surveyed, Springfield to Eureka, 72 miles.

Venice, Marine & Eastern.—Proposed, East St. Louis to Indiana State line, 150 miles. Frank McCambridge, Venice, Ill.

WISCONSIN.

Canada, La Crosse & Southwestern.—Proposed to run from St. Joseph, Mo., to Sault Ste. Marie, Mich. Surveyed Des Moines, Ia., to Wausau, Wis., 360 miles. F. A. Roziene, La Crosse, Wis., President; R. Calvert, La Crosse, Secretary.

Chicago, Lake Geneva & Pacific.—Projected, Lake Geneva to Portage, 100 miles, 60 miles graded. John E. Burton, Lake Geneva, President.

Chicago, Milwaukee & St. Paul.—Surveyed, Berlin to Wausau, 75 miles.

Chippewa Falls & Ashland.—Surveyed, Chippewa Falls to Ashland, 130 miles. T. C. Pound, Chippewa Falls, President.

Wisconsin Central.—Projected, Marshfield to Chippewa Falls, 60 miles; Wausau to Abbottsford, 68 miles.,

MANITOBA.

Winnipeg & Hudson Bay.—Projected, sLake Manitoba to saskatchewan river, 200 miles. Hugh Sutherland, Winnipeg, Man., President.

Ontario, Manitoba & Western.—Projected, Port Arthur to Winnipeg, Man., 400 miles. Jas. Conmee, Toronto, President.

MINNESOTA.

Duluth, St. Cloud, Mankato & Southern.—Surveyed, Duluth to Lyle, 325 miles. John Cooper, St. Cloud, President; N. B. Evarts, Webster City, Ia., Chief Engineer.

Duluth, Glencoe & Southwestern.—Projected, Duluth to Glencoe, 180 miles.

Lake Superior & Southwestern.—Surveyed, Rochester, Minn., to Northwood, Ia., 60 miles. A. Knox, Austin, Minn., President; C. D. Belden, Austin, Secretary.

Minnesota & Southeastern.—Projected, No. Pac. Junction to Superior Jc., Wis., 45 miles. James M. Paine, Minneapolis, President.

DAKOTA.

Minnesota & Dakota.—Located, Fargo to near New Rockford, 200 miles. Henry Cutter, No. Wilbraham, Mass., President. Job Voak & Co., Wilmot, Wis., contractors.

Northern Pacific.—Surveyed, Johnson to International boundary, 40 miles; Edgerly to Fort Yates, 85 miles; Logan and McIntosh county line to near Bismarck, 57 miles; near Bismarck north, 45 miles.

St. Paul, Black Hills & Pacific.—Surveyed, Dickinson to Deadwood, 200 miles. L. G. Johnson, Aberdeen, President; W. L. Richards, Aberdeen, Chief Engineer.

St. Paul, Minneapolis & Manitoba.—Duluth, Pierre & Black Hills.—Located, Aberdeen to Pierre, 128 miles.

Sioux Falls, DeSmet & Northern.—Surveyed, Sioux Falls to Oakes, 200 miles. J. H. Carroll, DeSmet, Dak., President; M. S. Parker, Winona, Minn., Chief Engineer.

NEBRASKA.

Chicago, Burlington & Quincy.—Located and partly graded, Crete to Grover, 13 miles; Arcadia to Brewster 45 miles; Culbertson to Holyoke, Col., 84 miles.

Union Pacific.—Graded, North Bend to Stanton, 40 miles; Kearney to Milidale, 75 miles; Nantasket to Pilot, 30 miles.

IOWA.

Winona & Southwestern.—Projected, Ft. Dodge to Omaha, 130 miles; Ft. Dodge to Sioux City, 115 miles.

PERSONAL.

Mr. MELVIN C. FRENCH has been appointed Superintendent of the South Braintree, Mass., water-works.

Mr. J. P. MONTGOMERY, Superintendent of the Ohio Valley road, at Evansville, Ind., has resigned.

Mr. DEXTER BULLARD has been appointed Superintendent of the Worcester, Mass., water-works, vice Mr. A. G. PEASE.

Mr. JOHN BOGART, Secy. Am. Soc. C. E., State Engineer of New York, is a candidate for re-election on the Democratic ticket.

Mr. A. SCHNAEDELBACH has been appointed to a temporary position as a civil engineer in the water department of St. Louis, Mo.

Mr. A. J. HILL, of New Westminster, B. C., is the engineer in charge of the work to be carried out by the Delta Dyking & Draining Co.

Mr. WILLIAM HILL, Division Master Mechanic of the Chicago & Alton Railway at Slater, Mo., has tendered his resignation.

Mr. GEO. SKINNER, lately Superintendent of the Scioto Valley road, has been appointed Superintendent of the Chattanooga, Rome & Columbus road, vice Mr. J. R. SHALER, resigned.

Mr. E. BERRYMAN has been appointed Engineer of the Quebec Central Ry. Co., and the staff of the Permanent Way is now under his control. Mr. FRANK GRUNDY is General Manager.

Mr. J. H. KAIN has been appointed Chief Engineer of the Mexican Central Railway, with headquarters in the city of San Luis Potosi. He was one of the assistant engineers in the construction of the work, and has been engaged on it ever since.

Mr. E. A. WILMOT, of New Westminster, B. C., has been appointed Engineer in Chief to prepare the design for the Coquitlam water-works system, and Mr. A. E. HILL, of New Westminster, has been appointed Assistant Engineer.

Mr. RIDENOUR, of Indianapolis, Ind., died recently. He was one of the projectors of the Cincinnati, Hamilton & Indianapolis Ry., and the first president of that road, which is now a part of the Cincinnati, Hamilton & Dayton Ry.

Messrs. RUDOLPH HERING, SAMUEL M. GRAY, and DAVID E. MCCOMB have been appointed by the President as a Board of Engineers to examine and report on the system of sewerage in the District of Columbia.

Mr. A. M. WELLINGTON has been engaged by the Board of Trade of Toronto, to report on the terminal facilities of that city, and on modes of relief from the increasing embarrassments therefrom.

Mr. F. R. F. BROWN, of Montreal, Mechanical Superintendent of the Canadian Pacific Railway, has resigned his position to become General Superintendent of the Dominion Bridge Co., at Lachine, P. Q. Mr. BROWN has been Mechanical Superintendent for six years. He will be succeeded by Mr. ROGER ATKINSON, the foreman of the shops.

Mr. M. C. KIMBERLY has been appointed General Superintendent of the Northern Pacific, to succeed Mr. S. R. AINSLIE, who recently resigned to become General Manager of the Wisconsin Central. Mr. KIMBERLY has been Assistant General Superintendent, with offices at Helena, Mont., for some time past.

Mr. JOHN THOMAS, Superintendent of the Cleveland & Pittsburg Division of the Pennsylvania lines, has been made General Agent of the Cleveland & Pittsburg Division, vice REUBEN F. SMITH, transferred. His office will be in Cleveland. Mr. L. F. LOREE, Engineer of Maintenance of Way of that division, has been made Superintendent, vice Mr. THOMAS.

Mr. CHARLES HANSEL, of Springfield, Ill., until recently Chief Engineer of the Wabash, has been appointed Consulting Engineer, to examine and report on the interlocking switches and the physical condition of railways in the State of Illinois. His appointment comes from the State Railroad and Warehouse Commissioners.

Mr. J. GORDON, lately Borough Engineer of Leicester, England, has been appointed to fill the position lately held by Sir JOSEPH BAZALGETTE, as Chief Engineer of the Metropolitan Board of Works, London. Mr. GORDON has distinguished himself as a sewerage engineer not only by his work in Leicester, but also in having made designs for a number of cities in Germany, among which are Munich, Ludwigshaven, Dortmund, Stuttgart, Nuremberg, and Heilbronn. He was likewise engaged as assistant on the sewerage of Frankfort.

Mr. STEVENSON TOWLE, M. Am. Soc. C. E., who recently resigned his position as one of the Park Commissioners of New York City, has been appointed by Public Works Commissioner GILROY as Consulting Engineer in Charge of Pavements at a salary of $5,000 per year. This is a new office, created by the same legislative act which provided for the expenditure of $3,000,000 in improving the street pavements of the city, the money to be spent at the rate of $1,000,000 a year.

Mr. W. A. PRATT has been appointed Division Engineer of Maintenance of Way of the Philadelphia Division and branches of the Baltimore & Ohio lines east of the Ohio river. Mr. B. T. FENDALL has been appointed Division Engineer of Maintenance of Way of Main Stem and branches east of Keyser, W. Va. Mr. J. A. HUNTER has been appointed Division Engineer of Maintenance of Way of Main Stem and branches west of Keyser. Mr. A. H. JOHNSON is Engineer of Maintenance of Way. Mr. ALFRED WALTER is General Superintendent.

BOOK REVIEWS.

Thermodynamics of the Steam-Engine and other Heat Engines. By CECIL H. PEABODY, Assoc. Prof. of Steam Engineering, Mass. Inst. of Technology. New York, 1889. John Wiley & Sons, 8vo., illustrated, pp. 470 Price, $5.00.

This work is especially designed for the instruction of students in technical schools, presenting the general theory of thermodynamics and discussing the properties of gases and vapors. The novel feature of the work lies in the treatment of the steam-engine, where, instead of presenting approximate theories based on more or less sound assumptions of the changes of steam in an engine cylinder, actual engine tests have been collected, arranged, and compared, and from these results the effects of varying types and conditions are deduced. As a text book the expression is clear, the mathematical portion simple and limited in amount and actual working results are preferred to vague theories. An excellent feature, too often neglected in similar works, is a reference by footnote to the source of all outside information.

Steam-Engine Design. For the use of Mechanical Engineers, Students, and Draughtsmen. By JAY M. WITHAM, M. Am. Soc. Mech. Eng., Professor of Engineering Arkansas Industrial University, late Asst. Engineer U. S. N. New York, 1889. JOHN WILEY & SONS, 8vo., 200 illustrations, pp. 391. Price $6.00.

This work is devoted to the practice of engine design solely, with a short introduction treating of the more general elements entering into steam engine practice. The pistons, slide-valves, valve and reversing gears, steam-chests, etc., are treated under separate heads, fully illustrated and mathematically treated. The compound and triple-expansion engines are more briefly described in principle rather than detail. Chapters on indicator diagrams, crank-effort diagrams, influence of friction on turning power, on shafting, condensers, screw propellers, etc., follow. The book is profusely and well illustrated and the examples given are apparently taken from the best and most approved practice.

A Theoretical and Practical Treatise on the Strength of Beams and Columns, in which the ultimate and the elastic limit strength of beams and columns is computed from the ultimate and elastic limit compressive and tensile strength of the material by means of formulas deduced from the correct and new theory of the transverse strength of material. By ROBERT H. COUSINS. E. and F. N. SPON, New York. 1889. Octavo, cloth, pp. ix. 170. Price $5.00.

The theory here set forth mainly depends upon the hypothesis that in any section of a beam the sum of the moments of the horizontal tensile strains is equal to the sum of the moments of the horizontal compressive strains. This theory is certainly not new. It was developed by NAVIER in his earlier writings, but was afterwards abandoned for the correct and rational theory. Among others who have enunciated this doctrine may be mentioned DUHAMEL, and also BARLOW, who in his first book supported it and in his second renounced it. In ENGINEERING NEWS of Oct. 29, 1887., Mr. THOS. H. JOHNSON called attention to it in an article entitled "The Neutral Axis in Unsymmetrical Sections," and assuming the hypothesis above stated deduced the position of the neutral axis which be found for an unsymmetrical section not to pass through the center of gravity as the common theory demands. This article was followed by a lengthy discussion in which a number of able correspondents showed the untenable nature of the fundamental hypothesis, and in which the interesting fact was developed that a well known American author had, in the first edition of a work on structures, enunciated it as correct and in the second edition expunged it as erroneous.

It may confidently be predicted that history will repeat itself, and that Mr. COUSINS, who has certainly shown much industry and ability in writing this book, will in time recognize the error of his theory and return to the support of the common formulas now upheld by all other authors. His devotion to his peculiar theory is perhaps nowhere so fully indicated as in the statement that he omits to publish the chapter on "Beams of Maximum Strength with Minimum Material" because he is not yet protected by letters patent. Before presenting the application for this patent, let us suggest that he consider the arguments set forth in Vol. XVIII. pp. 352, 404, 443, and Vol. XIX, pp. 11, 28, 48, 84, of this journal. There will be found in plain and simple language the proofs of the following theorems relating to the internal stresses in a section of a beam: 1st. The sum of the horizontal tensile stresses is equal to the sum of the horizontal compressive stresses. 2d. The sum of the moments of the tensile stresses is not equal to the sum of the moments of the compressive stresses. 3d. If the elastic limit of the material be not exceeded, the neutral axis passes through center of gravity of the cross-section. These theorems are the basis of the common theory, a theory so firmly established that no one should venture to attack it without first showing the falsity of its fundamental principles and secondly showing the truth of the hypotheses that are offered to replace them. As the author shows neither of these things, his book may be dismissed without further argument.

PUBLICATIONS RECEIVED.

—*Interstate Commerce Commission. Export Rates, Inland and Ocean.* Pamphlet, 48 pp.

This is the report and opinion of the Commission in the case of the New York Produce Exchange vs. the New York Central and other Trunk Line railways. The Commission decides that there must be no discrimination between traffic consigned on through bills to foreign ports and that consigned to the seaboard. Both sides of the question are fairly presented by the Commission, and the decision seems in accordance with the intent of the law. Under existing circumstances, the Commission could hardly have made a different ruling.

—*Points about Drawing Instruments.* By THEODORE ALTENEDER, Philadelphia.

A well written and well illustrated treatise on the form and use of the various instruments made by this well-known maker.

—*Report of Proceedings of First Annual Convention of the North Carolina Association*, held at Raleigh, N. C., Feb. 6 and 7, 1889. I. C. CHASE, Wilmington, and Dr. JULIAN M. BAKER, Tarboro, N. C., Secretaries.

Aside from the minutes of the convention, the report includes the following papers:—"Public Water Supply of Towns and Cities in North Carolina," by Dr. H. T. BAHNSON, "Inland Quarantine," Dr. G. G. THOMAS: "Maritime Quarantine," Dr. W. G. CURTIS; "Necessity of State Intervention to Prevent Adulteration of Food and Drugs.' Prof. F. P. VENABLES: "Economical Disposal of Refuse," I. L. LUDLOW, C. E.: "Duties and Responsibilities of County Superintendents of Health," Dr. J. L. QUCKER: "Some Gains from Sanitation," Dr. J. W. Jones; "Sewerage of Cities and Towns," J. L. LUDLOW, C. E.: "Economical Disposal of Refuse and Garbage Furnaces," Dr. THOS. F. WOOD.

—*The Worthington High Duty Pumping Engine.*

This is an illustrated pamphlet, 11¾ x 9 ins., 76 pp., published by H. R. WORTHINGTON, New York, and printed in French and English for circulation at the Paris Exposition. In addition to descriptions and illustrations of different classes of Worthington engines and a list of engines manufactured, there are notes on the engines at the exposition, a lithograph view, and plans of the exposition and a view of the Eiffel tower. A large plan of the exposition is also given, showing the 11 different installations; there are altogether 23 pumps (including a 6,000,000-gallon high-duty engine) either in operation or on exhibition.

—*Publications of the American Statistical Association*, New Series, No. 6. June, 1889. 6 x 9 ins. Paper. pp. 241-288.

The sixth number of the new series contains a paper on "American Railroad Statistics," by Prof. ARTHUR T. HADLEY, read before the Association April 25, and a paper on "Statistics of Municipal Finance," by Prof. HENRY B. GARDNER, read before the Association Jan. 25. In addition we note among the miscellaneous matter a review by Prof. GEO. F. SWAIN of *The Manual of American Water-Works*, in which he says: "From many points of view, this is one of the most valuable pieces of statistical work which we have seen of late." This number also contains a condensed but comprehensive report of the Seventh Convention of Commissioners of Bureaus of Labor Statistics, furnished by Hon. HORACE G. WADLIN.

The Secretary and Librarian of the Association, DAVID R. DEWEY, calls attention to their Statistical Library, now in rooms 31-33, Rogers Building, Massachusetts Institute of Technology, Boston. A large number of valuable statistical works have been gathered in the 40 years since the library was founded, and the Secretary requests "reports of vital and social statistics, registration reports, census documents, municipal reports, documents relating to public works, reports of trade, commerce, taxation, finance, insurance, industry, labor, health, crime, education, and religion."

We hope to refer in a future issue to the papers on statistics of American Railroads and Municipal Finance.

SOCIETY PROCEEDINGS.

American Society of Civil Engineers.—The Committee on Revision of the Constitution consists of W. P. SHINN (chairman), C. B. BRUSH, and FRANCIS COLLINGWOOD, of New York, MENDES COHEN, of Baltimore, Capt. O. E. MICHAELIS, U. S. A., C. L. STROBEL, of Chicago, S. WHINERY, of Cincinnati. The committee is to submit an amended form of Constitution, if it lives up to the requirements of the resolution, on Nov. 6, and submit a final report at the annual meeting, Jan. 15, 1890.

Western Society of Engineers.—A regular meeting was held July 10, Vice-President C. MAC RITCHIE in the chair.

There being no reports of the Committee or other business before the Society, an informal talk took place on the matter of questions for discussion on prominent and pertinent subjects. The Secretary drew attention to the fact that very few subjects had been presented, and urged that members make a point of sending in for arrangement such matters as they think would be of general interest.

The Chairman gave notice that at the next meeting, to be held on Sept. 4, the following questions would be before the meeting, and he urged the Society to do what they could, either *vive voce* or by communications through the Secretary, to help the discussion.

Question 1.—As a means of rapid transit for the older portion of Chicago, would not underground electrical railways be profitable?

Question 2.—Systems of municipal engineering in very large cities.

The Secretary was requested to invite members of the Electrical Club to help the Society in the discussion of Question 1.

A paper on "Compound Lumber" will be read by Mr. G. A. M. LILJENCRANTZ.

The Secretary has requested members of the Society to prepare discussions as far as possible on the above questions for the next meeting, and also to prepare such topics as may occur to them as being of particular interest, in the shape of questions for discussion, and to mail same to him at the earliest possible date. All questions will be laid before the Board of Directors for arrangement and presentation.

JOHN W. WESTON, *Secretary.*

Irrigation in Montana.

The Montana Society of Civil Engineers has sent the following communication to the Constitutional Convention of Montana:

GENTLEMEN:—We, the Montana Society of Civil Engineers, would respectfully represent to your honorable body that the subject of irrigation is now assuming the greatest importance to the people of Montana; that in the near future there will be constructed large and extensive reservoirs, irrigating canals, and other hydraulic works of great magnitude, requiring a large amount of engineering skill and experience; and the lack of competent professional advice may lead to great loss of capital and life, as has been demonstrated in this Territory in the past, and more recently in the terrible disaster at Johnstown, Pa., and the requisite safety can only be attained by the inspection of the plans for such works and the works themselves by a competent engineer. In other States, particularly in California and Colorado, recognizing the necessity of such skilled supervision, the office of State Engineer has been created, and the incumbent charged with the inspection and supervision of such works.

We therefore would respectfully recommend to your honorable body that a provision be incorporated in the Constitution of the State of Montana, creating the office of State Engineer, to be appointed by the Governor, by and with the consent of the State Senate. We respectfully suggest that among his duties one of the most important should be the examination and approval or condemnation of the plans of all proposed reservoir dams and the periodical inspection of all dams and reservoirs in the limits of the State, in such manner as may be provided hereafter.

We would respectfully recommend, moreover, in case the office be created, that the State Engineer should be ex-officio a member of the Commission in charge of the State Lands.

ENGINEERING NEWS
AND
AMERICAN RAILWAY JOURNAL.

Published Weekly at Tribune Building, New York.

VOL. XXII. Saturday, August 10, 1889.

D. McN. STAUFFER A. M. WELLINGTON
EDITORS.
CHAS. W. BAKER E. E. R. TRATMAN M. N. BAKER
ASSOCIATE EDITORS.
GEO. H. FROST . . . . . BUSINESS MANAGER

Subscription. — UNITED STATES AND CANADA, $5.00 *per Year*; $2.50 *for Six Months*; $1.50 *for Three Months*; *Single Copies*, 12 *cents*. FOREIGN COUNTRIES, $6.56 *per Year*, or 3 *cents per number additional.*

Drawings and Photographs *of all new engineering works or designs, large or small, of interest from their magnitude, novelty or originality, as well as newly adopted* **Standard Plans** *for engineering structures or details, rolling stock, etc., are always desired for early publication. Also,* **Brief Technical Notes** *of the cost or manner of executing work, tests of materials, machines or other new devices, and* **News of New Construction** *of all kinds.* **Letters** *for publication must be accompanied by the name or card of the writer.*

Drawings for publication *should preferably be in plain black and white, considerably larger than they are expected to appear, with letters and figures in pencil only, all lines clean and bold.*

Coming Technical Meetings.

New England Roadmasters' Association.—Annual meeting at Boston, Aug. 21. Secy., W. F. Ellis, Woonsocket, R. I.

American Association for the Advancement of Science.—Annual meeting at Toronto, Canada, Aug. 28. Secretary's office at Salem, Mass.

Civil Engineers' Society of St. Paul, Minn.—Next meeting, Sept. 2. Secy., Geo. L. Wilson, City Hall.

Western Society of Engineers, Chicago, Ill.—Next meeting, Sept. 4. "Compound Lumber," G. A. Ltzencranz. Discussion on "Electric Underground Railways" and "Municipal Engineering in Large Cities." Secy., J. W. Weston, 78 La Salle St.

Association of Civil Engineers Dallas, Tex.—Next regular meeting, Sept. 6. Secy., E. K. Smoot, Elm and Austin Sts.

Roadmasters' Association of America.—The annual convention will be held at Denver, Col., beginning Sept. 10. Secy., H. W. Reed, Waycross, Ga.

Boston Society of Civil Engineers.—Next meeting, Sept. 18. Secy., S. E. Tinkham, City Hall.

THE opinions of some of the chief Western railway managers on the outlook for the properties which they control, a brief abstract of which is given elsewhere, seem very frank and not at all reassuring. They discuss the matter, however, in a public-spirited way. If State legislatures and boards of railway commissioners were able to take as impartial and just a view of the railway problem as do Messrs. HUGHITT, WALKER, JEFFERY, and others, we could soon reorganize our transportation systems on such a basis that they would give us better service at reduced rates and at the same time earn fair dividends on the capital invested—a consummation devoutly to be wished, but which is apt to be a long time coming.

To quiet the fears of any readers who may be disposed to go and dispose of all their railway stocks at a sacrifice on reading the gloomy outlook, as seen by the men who should be most familiar with the situation, it should be said that, for most of the Western roads at least, the trouble is not so much in the present as in the uncertainty of the immediate future. The Chicago & Northwestern system, for instance, was able to earn for the fiscal year ending May 31, $745,000 to put in the surplus account, after paying its operating expenses, taxes, interest on bonds, and dividends on common and preferred stock. If we can be sure of results as good as this, or even a good deal poorer, no one need complain much. The trouble is, however, that we are not at all sure what is coming. If the Interstate Railway Association should go to pieces; if the Interstate Commerce Commission should step in and emasculate it by forbidding diversion of traffic; if legislators are to go on with their anti-railway crusade, and not only pass laws to abolish traffic associations, but exercise their sovereign power to cut down rates as well,—if any of these quite possible events are to happen, the evils which Western managers foresee will be on us with a vengeance.

The great and crying need is the establishment of some definite relation between the railways and the public. We believe that some plan, which will effect this and preserve the equitable rights of both parties, will yet be presented.

IF contention between three different cities for the honor of holding a great World's Exposition in 1892 can be said to indicate that such an exposition will certainly be held somewhere, we might consider the holding of it reasonably assured. New York, Chicago, and Washington are now all three engaged through their daily press in "booming" their respective towns as sites for such an exposition, although little has yet been done by either, beyond talk, and pipe-laying for appropriations. As a journal published in New York, perhaps we ought to champion the claims of New York, and we can certainly do so conscientiously to the extent of ridiculing the suggestion of Washington as a site for such an exposition. Its terrific summer heat, its small population and limited hotel accommodation, the certainty that neither State, city, nor individual liberality, nor large "gate money," would help to lighten the burden thrown on Congress, all make Washington an absurd suggestion. New York is open to none of these objections to any great extent, and the attendance and "gate-money" would probably be larger here than at any other point on the continent, but there is one counterbalancing fact which should not be forgotten: as a point on the edge of the continent, New York cannot draw visitors from all directions as Chicago can, but only from the landward side. The Western people also spend money more freely than those of the East, and the population of Chicago is already a good million. There are nearly as many probable visitors within a night's ride of Chicago as there are within a night's ride of New York.

There are also many other strong points in favor of Chicago, which compel us to say that it seems to us that that city, and not New York, is the proper place for such a show, if it is to be held at all. If something definite and practical is not done somewhere soon, it has small chance of being held anywhere. Chicago is the most American of cities and the greatest single triumph of the American people; it has the pleasantest summer climate of any city on the continent; it has a strong and vigorous public spirit, and a local pride which will not permit the affair to languish for lack of effective interest by its leading citizens; its civic administration is comparatively clean and decent. The Tammany devil is probably not so black as he is painted, and in an affair of such national importance he would probably sink "politics" to some extent in the public interest; but the thought of so great a project presided over by HUGH J. GRANT, with all that his name implies, is not a cheerful or inspiring one.

CHICAGO will plunge into the enterprise, if once undertaken, with immense energy, we are satisfied. Its citizens will individually subscribe much more money than can be raised by popular subscription in New York, both from keener public spirit and because they have more to gain thereby; and both the city and the State are likely to give at least as much as would New York City and State. If one of the legitimate objects of such an exposition be to "show off the continent" to foreign visitors, as it certainly is, Chicago will serve the purpose much better than New York, since it is nearer the geographical center; and when we further remember its excellent hotel and railway facilities, and the added interest which the city still has from its almost complete destruction by the great fire of 1871, Chicago seems from every point of view the place of all places for a great exposition in honor of Columbus and his discovery of 1492. One shudders to think what the fair of 1992 to celebrate the 500th anniversary of the same event will be, for the fair in honor of the 400th, if it be held at all, will probably tax the strength of the strongest man to do properly within a month. It would probably be nearly twice as "big a thing" as the Philadelphia Centennial was, away back in the dark ages of 1876, when the country was young. The extent of the advance since then, brief as the period is, is one which the public at large but faintly comprehends, and there is therefore good reason and excuse for holding such an exposition. There was even good reason for holding one in 1889 to celebrate the adoption of the Constitution. That was New York's opportunity. She would have had claims before all others to have been the site for any kind of a celebration of that event. Having passed by that opportunity, the proper point for the fair of 1892 seems by all means Chicago, in the heart of the continent. New York will do, however, if it really has enough public spirit to go ahead and organize the thing before Chicago has its buildings under way, but we doubt if it has.

THE report on the sewerage of New York, which Mr. RUDOLPH HERING has just completed, is a valuable and exhaustive one, as might be expected from its source, and we trust it will shortly be printed and acted upon. The report contains an account of numerous preliminary investigations regarding the condition and defects of the present system, the methods of maintenance and their cost in various cities, the quantity of storm water reaching sewers under different conditions, and other preliminary matter of that nature. It then contains recommendations regarding improvements in design, both of general arrangement and of every detail, and in cleaning the sewers by better methods of flushing. The report is accompanied by a large number of maps, diagrams, and tables. We shall give our readers extracts of whatever has more general interest as soon as the report is available. There is urgent need of improvement, which ought not to be delayed, although New York is not quite so badly off in this respect as some other cities, owing to its topographical advantages, which ought to make it the best sewered city in the world.

As there is credibly alleged to be honor among thieves, there certainly ought to be honor among professional men, especially when the professional men happen to be likewise thieves. This hypothesis does not hold true with the *California Architect*. We have not the pleasure of numbering that journal among our exchanges, but we find in the Cali-

fornia *Mining Press* and in the *Pacific Rural Press* excellent photographic reproductions of the drawings of the Eiffel tower, which we published June 8, 1889, but with the name of this journal and its artist erased from the drawing, for which those papers declare themselves "indebted to the *California Architect*." As it is not to be supposed that journals honest enough to give credit for what they used from other papers would have done so with the name of this journal staring them in the face, or still less, have erased the name from the plate, the *California Architect* has shown himself a peculiarly shabby fellow, deserving this brief notice. He appears to have one merit, however, that he knows a good thing when he sees it; for among all the drawings of this graceful structure which have appeared, we think we may fairly claim this as, on the whole, the best.

THE amount of English capital now being invested in American industrial enterprises is very remarkable. The *American Economist* estimates that not less than $100,000,000 has been invested in American industries by foreigners during the past year. This amount may be excessive; but making all allowances for the sensational reports in circulation, it is certainly true that a very large interest in manufacturing enterprises of various sorts is being acquired by Englishmen. They seem to have studied American politics closely enough to find out that the omnipotent public on this side of the water is the avowed enemy of the railways and the close friend and helper of the manufacturers, and are guiding their investments accordingly.

Another explanation of the tendency of British investments is the very dubious character of most of the joint stock enterprises whose shares are offered to the public there. Space in the London financial journals seems about equally divided between the glowing accounts of the prospective profits which the latest formed companies are to reap and the proceedings of stormy shareholders' meetings, in which the time is taken up by profuse explanations of the reasons why dividends have not been earned. In fact, about the soundest and safest investments offered to Englishmen at present seem to be in American enterprises. It is not long ago since American railway enterprises furnished a chief outlet for surplus British capital, and a large amount of capital could now be obtained in England for many sound railway schemes if capitalists could be assured of even a moderate return for their investment. But notwithstanding the fact that the returns of earnings thus far in the year are very favorable, the unsettled relation between the railways and the public, and the fact that a State may at any time cut down the net revenues of the railways within its borders a half or more by an arbitrary reduction of rates, makes the future very uncertain; and capitalists are wary of sinking their funds in any new railway enterprise at present.

AN "important discovery," which is certainly important if true, is reported from Chicago, namely, a process by which "molten metal may be rolled into any desired shape, thus saving all intermediate processes." We have an impression that, as respects steel rails, this is not, accurately speaking, a new process, but rather an "improvement" on present practice, which Mr. WHITTEMORE has well described as "squirting metal through the rolls." In fact, the new process seems to have been invented primarily, not for rolling rails but for rolling tire plate or other very thin metal, for which it is not inconceivable that it may have a legitimate field of application. The first suggestion of the mechanism is said to have come from an effort to roll thin plates from molten solder. But the process is "pronounced by experts to be equally applicable to iron and steel in its various forms of plates, structural iron, and rails," and it is believed that "the cost of manufacturing steel rails, can be reduced to the extent of $10 per ton," and the cost of making iron plates for turning made even lower than in Wales,—if aided by an adequate duty, we infer,—"thus making a new industry in this country."

The hope of cutting off $10 or even $1, per ton on the cost of steel rails, by any such process, is, we are confident, chimerical. It is difficult to see wherein present processes are capable of serious reduction by so slight a change as that of rolling the metal in a fluid instead of a semi-fluid condition; but it is possible that from 25 to 50 cts. a ton might be saved thereby, and should this prove to be the case, we may confidently look to see some mill adopt the new process with enthusiasm. The interesting question then arises: Is it possible that the rails will be still worse than some of those now rolled, or if not, what will be their condition. We are given positive assurance, in the account of the new invention, that "iron and steel so rolled will be much more even and closer in texture than that made by the present methods," which will be observed to be a carefully guarded and cautious statement, as respects rails at least. It may be true; but, except for this statement, we should have been disposed to believe that even the poorest of the rails now rolled would be good and durable in comparison with those which would be obtained by a process of literally and actually "squirting" molten metal through the rolls.

AN unusually dry year in Utah seems to have turned the thoughts of some of the people of the Territory to the necessity, not only of providing more extended irrigation facilities, but also of collecting statistics regarding existing irrigation works. The Governor has sent out a circular urging county officials and water commissioners to aid in the collection of such statistics, and the Salt Lake *Tribune* suggests that these officials secure copies of maps from the surveyor-general's office, and mark upon it the streams in their county, and information regarding the ditches supplied therefrom. It is urged that the information will be needed long before it is made available by the general Government, and that the Territory should collect it and make it immediately available. A start could certainly be made in the above way; but as soon as possible the work should be organized and carried on under the direction of a competent engineer, or else it will prove of comparatively little value at present, and lead to complications in the future. It is to be regretted that the benefits to be derived from much of our Government work are so long delayed by tardy publication. The results of the work now being done in the arid regions are needed already, but may not be directly available to those most concerned for a year or two, or even more. Possibly the reports for the various divisions of the work may be published independently, as soon as each is written, in which case a part of this needed information would be available at an earlier date than otherwise.

IT now seems that the process of the late Mr. H. J. SEYMOUR, of Findlay, O., for extracting aluminum from clay, to which we alluded recently, has not been "lost to the world" after all. According to the *Iron Trade Review*, Mr. SEYMOUR made no secret of the general principles of his process, which were (1) that the natural affinity of aluminium for zinc can be utilized to vaporize and deposit aluminium; (2) that the apparatus for the work can be made to produce it on a commercial scale; and (3) that the materials, the operation, and the plant required are comparatively inexpensive. If there be merit in the process, other chemists of the company can, doubtless, make it manifest. The loss of the services of Mr. SEYMOUR is, certainly, a severe one for the company, for his inventive skill and intimate knowledge of the difficulties to be mastered cannot perhaps be replaced; but the reports which stated that the work he had already done had been lost to his employers were wholly misleading.

Sectional Representation in National Engineering Societies.

Although the great body of the profession may not yet realize it, the movement now pending in the American Society of CIVIL ENGINEERS to effect some material changes in its constitution, which has so far taken form that a committee to present a revised constitution has been appointed, is one more likely to powerfully effect the whole future of the profession for good or ill than any other single cause which can well be imagined. Nothing is clearer than that we are to have in this country in the near future a great and powerful engineering society, numbering probably, in its various grades, at least 10,000 members; for it is but natural that the membership should be about twice as large in this country as in England. Nothing is more certain than that the English Institution of Civil Engineers has been a powerful lever to raise the general status of the profession, and that a really analogous society will have the same effect in this country. It is also almost a certainty that here as there the "Civil" Society will be the comprehensive one, to which the various organizations of Mechanical, Mining, and Electrical Engineers will be more or less subordinate. It is so in England: the tendency in that direction is already visible here, despite somewhat adverse conditions. There is good reason why it should be so, as the broad term "civil engineering" includes any and all forms of engineering for civil or productive purposes, and mechanical, mining, sanitary, and electrical engineering are mere subdivisions of this broad field.

We deem it, therefore, a plain duty that we should aid, so far as we may, in insuring right action in any revision of the Am. Soc. C. E. constitution by discussing in advance the more important features of proposed changes, and so drawing out the general sentiment on the subject. Radical modifications of the present constitution are plainly necessary if the constitution is to become what it should be, and radical modifications are proposed in the only formal suggestions which have yet been made, those submitted by the Cincinnati Association of the Am. Soc. C. E., one of the most radical of these, which alone we propose to discuss to-day, being that, instead of electing five directors "at large," who may all come from one town (provided only it be in the State of New York), the number of directors elected shall be increased to fifteen, of whom three shall be elected from the resident membership, and two each from six other fixed geographical districts into which the continent is divided; the only method provided for changing these sectional divisions being that the Board of Direction shall first give a three months' notice to all members, and that then a two-thirds vote of the entire Board shall be

necessary to effect the change. A separate nominating committee from each district is provided for, who are together to nominate candidates for President and Vice-Presidents, and separately to nominate candidates for Directors from their respective districts, the number of nominees being in each case twice as many as the candidates to be elected, and the voters, consequently, having to erase half the names from each ticket. There would need to be, under this arrangement, a different ballot for each of the seven districts.

The present arrangements are radically different. In the first place, only the number of candidates who are to be elected are now nominated, so that the election lies practically with the nominating committee and not with the membership. Except in the rare cases when the disagreeable task of expressly organizing an opposition is undertaken, the sole privilege of the individual voter is to "scatter," with the knowledge that his scattering will be altogether useless.

In the second place, the number of Directors is much larger. The Board now consists of 10,—the President, two Vice-Presidents, Secretary, Treasurer, and 5 Directors. The proposed Board will consist of 19,—the President, three Vice-Presidents, and 15 Directors, the Secretary and Treasurer being left out of the Board, as they plainly ought to be, they being executive officers and servants of the Board, by which their actions are supposed to be supervised, and hence not properly members of it.

In the third place, so far from the present constitution providing for an equal representation of all geographical sections, it is now expressly provided that "at least one Vice-President, three Directors, the Secretary and the Treasurer shall be resident members," thus requiring that at least half the officers shall always be chosen from about a seventh of the membership. As the President also will often be a resident member, there will often be 6 officers out of 10 chosen from this small fraction.

A fourth important difference is that the Board of Direction now holds very frequent meetings and that all the routine business of the society, like examining applications and making small appropriations, is supposed to be transacted by the full Board. The effect of this and of the other two conditions just noted is practically (1) to make the real working Board consist of the five or six resident members, and (2) to throw the control of that working Board into the hands of two or three members, who will naturally tend to be the two permanent officers of the Board, the Secretary and the Treasurer, and some one other member who may vote with them. The practical effect is to make the two executive officers, or (as they ought to be) servants of the Board, practically the Board itself. There is not even any effective control of the management by the membership at large, from lack of a proper system of nominating and electing officers. A more absurd arrangement than this Pooh-Bah plan for the permanent management of a great National Society can hardly be imagined, and it will be astonishing if there should be a single voice raised in its favor. It suggests nothing so much as the jingle in the "Bab Ballads," which we hope all our readers have had the pleasure of reading:

> I am the cook and the captain bold
> And the mate of the Nancy brig.
> And the bo'sn tight, and the midshipmite,
> And the crew of the captain's gig.

Nothing but the fact that the permanent offices have so far been in excellent hands has prevented great harm resulting from this arrangement.

The proposed new constitution requires only two meetings per annum of the full Board, at which the general policy of the Society and the larger details of administration may be fixed, and provides for carrying on the routine *ad interim* business by a smaller Executive Committee. The objection that the law of the State of New York under which the Society is organized requires that a majority of the Board of Direction shall be citizens of the State of New York is neatly and somewhat satirically answered by a reference to later statutes.

The plain object of all these suggested changes is, (1) to prevent New York City being practically "the cook and the captain bold," etc., in the management of the Society; (2) to insure the expression of a real choice by every member whose vote is to count, instead of permitting him only to go through the form of approving a choice already made; (3) to throw the control of the Society where it really belongs, equally with all the membership; (4) to make a Board too large to be dominated by any one or two men; and (5) by relieving the Board as a whole from attending to all the details of administration to insure that its larger affairs will be more effectively and independently controlled.

All these objects have our sympathy, and especially that of giving every member everywhere an equal voice in the management of the Society; but it remains to be seen whether the provisions for securing this end just above noted—dividing the continent into seven distinct districts and requiring that two directors shall be elected from each—is really the measure best calculated to secure it, and one free from serious objection.

So far as this measure really gives every man everywhere an equal fractional voice in the management of the Society, it is of course right and just; but is this in effect secured, when it is required, say, that a man living in the "fourth district," which by the proposed lines of demarcation would be the States of Pennsylvania and Maryland and the District of Columbia, must vote for two of the four men nominated from that district, or not at all?

This proposal is plainly copied from the system which prevails in the election of members of Congress, but there are reasons for it in the one case which do not obtain in the other. There are, in the first place, real local interests and preferences to be represented; and there is, in the second place, a real local constituency to be represented which, in the main is fixed, and remains the same in substance for a lifetime. The engineer, however, is a professional vagabond, and it is seldom that he is for many years together in the same town or State, while it is the rule rather than the exception that he is born in one State, educated in another, and is professionally engaged in still another. Moreover, the profession is not so large as to make it unlikely that every man in it who has advanced far enough to reach the status of a full Member of the Am. Soc. C. E. should have a considerable personal knowledge of the men all over the country who belong in the still shorter list from which candidates for office are likely to be selected, and he may well know intimately men in other geographical sections, for whom he would like to vote, when he does not know at all the four men put in nomination from his own section, or does not care to vote for any of them.

Again, are there any such distinctively local interests in the management of such a body as to make it either necessary or desirable that there should be just two and no more men in it from each of seven geographical districts? Is it really desirable that each of the 15 directors should feel that he is the representative of one-seventh of the membership only, instead of the choice of the whole? It appears to us doubtful, while it certainly does not appear doubtful that, if there are to be 30 nominees annually for the office of director, the end of a full and complete representation of the will of every member will be best secured by permitting each voter to choose from this list the 15 whom he judges would best represent him, leaving the 15 who obtain the most votes under these conditions to be declared elected, wherever their residence might happen to be.

It appears quite clear that, as regards the actual election, this is the surest and fairest way of obtaining a completely representative governing body; but on the other hand, it cannot be denied that there would be a tendency among members residing, say, on the Pacific coast, to prefer to vote for candidates residing on that coast, and that this natural preference would be defeated unless there were some provisions to insure that each large section of the continent should be fully represented on the list of nominees. It would appear, therefore, as if the true way of insuring a fair representation of all sections would be to require that the nominations should be distributed with approximate uniformity geographically, but that there should be no provision requiring the election of officers distributed with the same geographical exactitude, unless it shall turn out that the members living in each group prefer to vote for and elect their local candidates.

This will be especially true if another principle be embodied in the revised constitution, which we shall be very sorry to see omitted, that of cumulative voting. The principle of cumulative voting is universally admitted to be the only fair one. It alone provides for the full and complete representation of minorities. It is already in force in the State of Illinois and in various other States throughout the world, and in the American Society of Mechanical Engineers, whose constitution provides:

> ART. 32. In the election of Vice-Presidents, each Member and Associate may cast as many votes as there are Vice-Presidents to be elected (6). He may give all these votes to one candidate or distribute them among more, as he chooses. Managers (9) shall be voted for in the same way.

The objection to cumulative voting for general elections is that it requires a certain intelligence and care in preparing the ballot, or it may be thrown out and the voter disfranchised. It is doubtful if this objection be valid even for popular elections; it certainly is not valid in a body like the Am. Soc. C. E., composed exclusively of fairly intelligent men. Every voter who cares enough about the affairs of the Society to do so will have no difficulty in grasping at once the proper method of making out his ballot. It is rather an advantage than otherwise that if he do not care enough about the effect of his vote to take this slight trouble, his ballot will be thrown out. It is one of the great evils of the present system that the mere re-enclosing in a directed envelope of a printed ballot, with whose preparation the voter has had nothing to do, counts as a vote as much as an expression of intelligent choice.

Under the cumulative system, there would simply be a list of 30 nominees for the 15 directorships to be filled, from which every voter must strike at least 15 names to have his ballot count at all; but in lieu of doing so, he may, if he choose, cast 10 votes for Smith, 3 for Brown, 1 for Jones, and 1 for Robinson; or cast the whole 15 for Jones; or divide them up in any manner he pleases among any number

of candidates less than 15. No voter is thus compelled to vote for candidates whom he does not know or know about, and it lies in the power of a small group of voters anywhere to practically insure the choice of any one man, if either his residence, nativity, opinions, or general character happen to suit them. Consequently, all necessity for explicit representation of geographical sections disappears. Given some provisions for a fair distribution of the nominations geographically, if the voters in any section really care to elect their local men, they can always do so. Of course, under this system, some well-known or very popular men might secure much more than a majority of votes, and others much less. If there were 1,000 voters, for example, or 15,000 votes to be cast to elect 15 candidates, the highest candidate might have 2,000 or 3,000 and the fifteenth only 200 or 100. They would be likely to have weight in the Board according to the number of their votes, however, and if the election be by plurality, there must always be at least 15 elected.

There is another reason which favors this plan: it is eminently desirable that there should not be too great or too frequent changes in the composition of the Board, and yet it is perhaps as well that the whole Board should be elected or re-elected annually. To secure this end, it ought to be established, either by law or custom, that the entire board of officers, from the President down, should be renominated *ex officio*. There may be some objection to establishing this rule as respects the office of President, because there is a general ambition to attain that office in time and consequently to have frequent changes in it; but, in our judgment, every voter should have a chance to say every year whether he preferred to continue the old President in office or have a new one; and still more so in regard to the minor offices.

Under the conditions previously outlined, unless any given section is already provided with twice as many representatives as its numbers entitle it to, it will always be possible to renominate all old officers and yet give that section only its fair numerical proportion of the next list of nominees. Suppose, for example, the resident or New York membership to be entitled to six nominees for the office of director and three directors, but suppose that at the last election five of the six nominees were elected. There would then be only one new nomination from that district in addition to the five renominations *ex officio* On the other hand, if the Pacific group of States were represented by no members of the Board, they would still have four representatives on the new list of nominees, and so, i they continued unrepresented, it would be by the deliberate preference of their own constituency.

These arguments point to the conclusions (1) that there should be an approximate but not absolutely rigid distribution of nominations to all sections of the continent equally, in proportion to membership; (2) that all old officers should be renominated *ex officio*; (3) that there should be absolute freedom of choice in regard to voting, every member casting 15 votes for any person or persons he pleases regardless of residence. The more the subject is studied, the more, we are confident, will these conclusions be approved of.

Passenger Lifts and Rapid Transit.

On another page will be found some hint of the problems that must be discussed and solved before any really efficient rapid transit scheme for this city can be settled upon. Our correspondent on this question whose communication appears elsewhere, has evidently gone deeper into the question of low-level vs. shallow tunnels than we did when writing our editorial. The experience gained in building the Metropolitan underground railway in London, the difficulties encountered in passing under surface obstructions, and the enormous cost of this class of work, when contrasted with the comparatively easy and cheap driving of a deep rock tunnel, caused us to make an insufficient allowance, perhaps, for the time and quantity factors in handling the traffic. As these factors enter as well into another scheme which we have regarded with some favor, that is, a high-level elevated road, it would seem proper to here discuss what has been done with passenger elevators of large dimensions up to the present time.

The elevators in use at the Mersey tunnel, at Liverpool, and at the Eiffel tower in Paris, seem to approach nearer in cage capacity and service to what would be required in a deep tunnel than any of which we have available records. The Mersey "lifts" or elevators have been in use since 1885, and so far will meet the service demanded. They are hydraulic elevators, three in number, and lift 93 ft. Each cage is 19 ft. 6 ins. long by 16 ft. 6 ins. wide and 8 ft. 10 in. high; they weigh 30 tons each loaded, and will carry 24 passengers seated, but each car can carry 100 passengers at a time. The working speed is at the rather slow rate of 2 ft. per second, or about 120 ft. per minute, the ascent of 92 ft. being made in from 30 to 40 seconds on an average journey, according to the paper of Mr. Wm. Edmund Rich on these lifts in Proceedings Inst. C. E., vol. lxxxvi., from which these data are obtained. Making a proper allowance for time consumed in loading and unloading, it is figured that twenty-five trips per hour can be made each way, and that the three lifts can convey to the upper surface in this period of time 7,500 passengers, an average of 2,500 per car.

At the Eiffel tower there are 6 elevators. Two of these are of the Roux type, lifting 187 ft. Each cage has a capacity of 100 passengers, and the speed is 197 ft. per minute. Two others, of the American Otis type, also start from the ground, lift 377 ft. at a speed of 394 ft. per minute, and handle a car carrying 50 passengers each. Finally, 2 Edoux elevators each carry a car with 60 or 70 passengers through 582 ft. of the tower, to the upper platform, 905 ft. from the ground, at a speed of about 177 ft. per minute. To better contrast the work performed by these elevators, and including the Mersey lift, they may be tabulated as follows:

Elevator	Height Lifted	Capacity of car	Speed per min	Capacity of 1 car per hour reduced to 100 ft. lift
Mersey	92 ft.	100	120 ft.	2,600 passengers
Roux	187 "	100	197 "	3,000 "
Otis	377 "	50	394 "	2,000 "
Edoux	528 "	60-70	177 "	1,820 "

The last column is based upon an allowance of one-half minute each to load and unload the car, and on the assumption that the passengers are on hand to keep the car running continuously. The Otis and the Edoux elevators, with their smaller cars, do not make a fair showing, though the speed of the American type far exceeds that of its rivals. Supposing that the same speed can be maintained on the larger car, the Otis capacity would be 4,000 passengers, and that of the Edoux 2,800 passengers. It is to be seriously questioned, however, whether the interval of time here allowed would compensate for the rush of an American crowd, such as can be frequently seen at one of our elevated stations. Double doors to the cages and better policing would of course facilitate the handling of the traffic, but would also add materially to the maintenance expenses.

In discussing the transit problem in New York, elevator speed must be based on American practice, undoubtedly the best in the world. With us, 350 ft. per minute for passenger elevators is common enough; but even at this speed, it would require at least four elevators of a capacity of 100 passengers each, to lift 500 persons 100 ft. every minute, as our correspondent believes might be the "rush capacity" demanded at any one station. We do not doubt that American manufacturers would be equal to the task of providing the elevators for a deep tunnel; but the cost of original construction and installation and the permanent cost of operating them are problems requiring very careful study before adopting elevators as an essential part of any transit scheme.

In estimating the demand upon an elevator service, it will not do to average the traffic. A traffic of 200,000,000 per annum averages only about 550,000 for every day in the year; and this divided among 164 station platforms would give only about 3,300 to each platform, per day, a number easy enough to handle in that time, or even in five hours of each day. The trouble will come with a sudden rush upon some one station, and that may be located anywhere, when three times the daily average may demand transport in a fraction of an hour. Of course, any system of transport may be blocked to some extent by a similar rush; but as the well-known advantage of passenger over freight transport is, that passengers, under ordinary conditions, handle themselves at the termini, the nearer a rapid transit line can approach to this type of disposal, the more economical will be the management and the more generally satisfactory the service to the passenger. An American crowd resents delay even to the fraction of a minute, as our correspondent intimates, and ease and certainty of disposing of the passengers is a most essential feature in deciding upon any rapid trasint scheme.

Nevertheless, at the Brooklyn end of the Brooklyn bridge, which is the most crowded railway terminus in the world, only 10,000 to 12,000 passengers are handled in the most crowded hour, 8 to 9 A. M. For a few moments together at this point, on days of specially heavy travel, it may rise to the rate of 16,000 per hour, but that is about the maximum, except on very exceptional days, which cannot be completely provided for. Four Otis elevators, running at 400 ft. per minute, and carrying 100 passengers each, would carry without delay even this enormous crowd, and judging by experience on that bridge, the four elevators would need to run only four hours per day, two in the morning and two in the evening, while even so many as two elevators would only be needed for about three hours daily more. For 17 hours out of the 24, therefore, one elevator would suffice for even this enormous traffic: while at almost any other station one or two such elevators would do the whole work easily, even at the most crowded hour.

Again, the height of the lift makes but a very trifling difference in the capacity of such elevators per hour. Assuming, as above, 30 seconds per trip for loading and unloading, stopping and starting, which is certainly a small enough allowance, and assuming running speeds of 180 and 360 ft. per minute, the comparison will stand as follows:

Time per trip in seconds.

Lift	Speed 180 ft.	Ratio	Speed 360 ft.	Ratio
10 ft.	33⅓	1.0	31⅔	1.0
50 "	47⅓	1.4	38⅓	1.2
100 "	63⅓	1.9	46⅔	1.5
200 "	96⅔	2.9	63⅓	2.0

Hence, if it be practicable to use elevators for any moderate lift, like 10, 20, or 30 ft., it is also practicable to use them for 50 to 100 ft. lift, and the question arises: Would not even the present lines gain enough extra passengers by using elevators, if they had room to place them, to pay for the extra cost of running, and if so, would there not be compensations for the extra expense of using elevators for a very high level or very deep tunnel line, besides the saving in right of way and other construction expenses?

Moreover, the saving in right of way would be enormous. Assume stations 1,000 ft. apart, or only four New York blocks; assume a right of way 25 ft. wide, which in practice would be too little. There would be on this strip 8 city buildings. Would not any one think those buildings cheaply purchased if given to them in return for operating a couple of powerful elevators? Evidently they would, because owners will put in 8 to 16 such elevators on such a property merely to increase the rental value of the upper stories.

The question, therefore, is not one in which it is admissible to be dogmatic on either side: it is a question to be settled only by exact estimates of lines far above the surface with elevators, and just above the surface without them. On the whole, although we have endeavored to state all the arguments for a low-level line and against high-level lines fairly, our impressions decidedly favor the high-level line, which would practically destroy no real estate whatever. A large amount would have to be purchased, involving an enormous capital investment; but the rental value of the property would rarely be decreased by the high-level line (the piers being supposed to be in the middle of the blocks between the building), and at points would be appreciably increased, especially near the stations.

On the other hand, the low-level line practically destroys all the real estate that it passes over. The space under the track is too noisy to be worth much, and that above the track is available only by throwing the railway into a tunnel, as it were, which makes it disagreeable for passengers, and would in any case only be expedient with very valuable downtown property.

A further factor in the problem is that the value of real estate is quite certain to tend steadily upward, while the cost of operating elevators is quite certain to tend steadily downward, if it changes at all, owing to progress in the engineering arts, which are all still young.

CORRESPONDENCE.

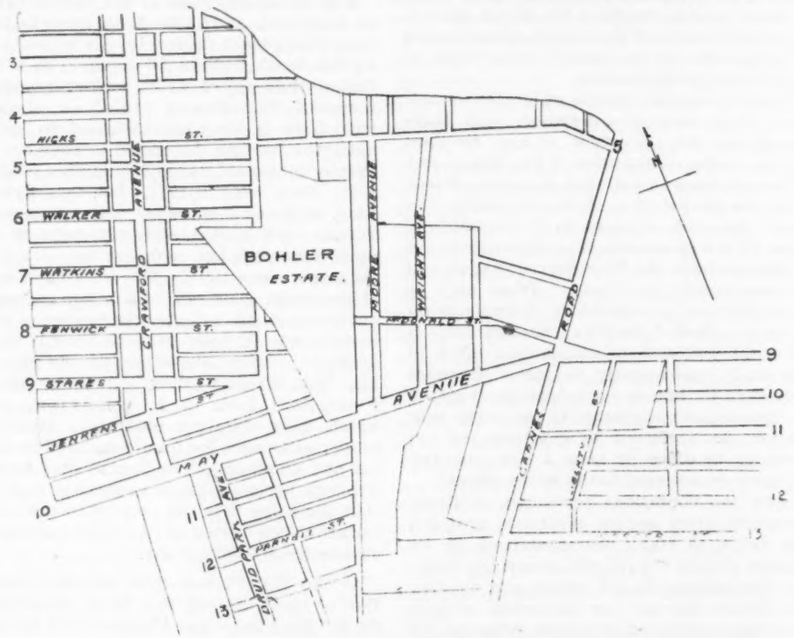
House Numbering.

AUGUSTA, Ga., July 23, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

Will you, or some one of your readers, tell me how to number the enclosed map? The older part of the city lies east of Carnes road, and is numbered on the decimal plan, 25 ft. being allowed per number, giving 1,250 ft. as the limit of a block, or the distance at which the hundred would run out. The section west of Ferry street is regular and can be numbered without any trouble. But how would you number the lots, or dwellings, on either side of Moore avenue? The block extends, you observe, from Rollersville road to McDonald street, or from the 500 to the 800 in numbers. Now if we number in the 500 to McDonald street, and then begin on the other side with 800, it would look and appear very strange. It is likely that at some future time McDonald or Eighth street will be continued through the Bohler property. If a party live at 627 Crawford avenue and wishes to send to 627 re avenue, he would naturally direct the messenger to a point in front of him. If Moore avenue is numbered in the 500 to a point where, if Sixth street were produced in an imaginary line, it would intersect it, and begin here with the 600, it would cause the numbers to be directly in front, east and west, of each other, but it would look absurd on the street. Suppose the last house was 539 and the next 601, though their lines adjoin, why, the community would say the engineer was an ignoramus. Again, the block on Liberty street, between May avenue and Silcox street, would have to be numbered from 900 to 1,100, jumping 100. The house on the northeast corner would be, say, 947 and the one on the southeast corner would be 1101. Again, at the intersection of McDonald street and Walton way or May avenue, if May avenue is made Tenth street, 900 is lost for all numbers in blocks between Fenwick street and May avenue. Lots would then end on Gardner, Wright and Moore avenues at May avenue in the 800, and begin at Chaffee, Emmett and Druid Park avenues at May avenue in the 1,000. What system of numbering could be used here? That part of the city east of Carnes road being already numbered, makes May avenue the ninth street east of Carnes road, and yet on Milledge street the distance from Fenwick street (Eighth) to May avenue (tenth) is too great to number in the 800, being over 1,250 ft., which would throw this part of May avenue, you see, between the 900 and 1,000, making it Tenth street. I would be obliged if some one would let me know what is the practice in other places, where the numbering is on the decimal plan.

Very truly yours, CITY ENGINEER.



House Numbering Problem: Augusta, Ga.

[Our correspondent has struck one of the common snags in attempting to adjust the decimal system of house numbering to converging streets. There is simply no set rule which will apply to all cases, and the engineer must use his best judgment regardless of what the average citizen may deem "strange or absurd." Unless a city is laid out on the plan of a gridiron, like Philadelphia for example, numbers are necessarily mixed and sometimes hopelessly so, as in this city of New York. As to the Moore avenue question, we would suggest the skipping of numbers, making them read 504, 508, 510, or any other sequence that will cover the space and bring you out on May avenue at, say 900. As this latter is a comparatively straight and seemingly main thoroughfare, it would seem better to continue the numbers from it as in the old town. If the distance between Fenwick St. and May Ave. on Milledge St. is too long, it is better to adjust this by numbers and letters, as 904 A, 906 A, etc., than to upset the numbering of a whole district on account of one block. But as a rule, in the case of a similar crooked location, it would seem better to start with a main street and number east and west or north and south, consecutively, without regard to the blocks. The proper application of the decimal system presupposes regular streets, numbered in one direction and named in the other, and this evidently cannot be successfully done in the case in question. Even Philadelphia has duplicate numbers on the same street, where the growth of the city and the curve of the river front has built up streets that extend across the zero line. In this case the word "east" and "west" of the zero line designate the relative positions of the numbers on the one street. It should be said that in that city the numbered streets extend indefinitely west from the Delaware river and the cross streets number north and south from Market St.—ED. ENG. NEWS.]

The New St. Augustine Artesian Well.

ST. AUGUSTINE, FLA., Aug. 2, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

I notice in your issue of July 27, 1889, a notice in regard to an 8-in. artesian well lately completed in this city.

Enclosed I send you clipping from the *Times-Union*, published at Jacksonville, Fla., that will give you some information in regard to this well.

Mr. HARRY JOYCE, who had charge of the work drilling this well, has been thus engaged the past seven years in this State, was here when the 10-in. well was put down for the Ponce de Leon Hotel, and has had charge of putting down three wells for the Ponce de Leon Hotel since, says that the 8-in. well above referred to is the best well in all respects that he knows of anywhere.

It was tested in the writer's presence before the derrick was taken down, and threw water, correctly measured, as follows: an 8-in. solid stream nearly 8 ft high above the top of pipe at ground surface, a 5-in. stream 19 ft. high, a 4-in. stream 24 ft. high, a 3-in. stream 28 ft. high, and a 2½-in. stream 30 ft. high, all straight up into the air.

The pressure at ground surface has not yet been taken, but from a test made several feet above the ground with an Ashcroft water gauge, it is estimated that the pressure is between 25 and 28 lbs. and that the well will put water up in a stand-pipe from 57 to 64 ft.

As regards the flow of water, I can only say that Dr. Rainey spent considerable time in getting data in various ways, and after a long and careful investigation and computation, concluded that the flow yielded over 11,000,000 galls. water each 24 hours.

I am, very truly,
C. L. PARKER.

[The cutting referred to states that this well is just beyond the city gates of old St. Augustine. It is said that the water has a soft, pleasant taste, is clear, and has hardly a trace of sulphur. Mr. JOYCE, who sunk this well, has also lately completed one at Jacksonville, Fla. This latter well is 1,020 ft. deep, has a top pressure of 25 lbs., and the flow is given as being 3,360,614 galls. in 24 hours.—ED. ENG. NEWS.]

The Kutter Fund.—Correction.

NEW YORK, Aug. 7, 1889.

TO THE EDITOR OF ENGINEERING NEWS:—

Your remarks in connection with the letter of Dr. BURKLI-ZIEGLER about the Kutter Fund need a correc-

tion. You credit me alone with having led you to start the fund. Mr. JOHN C. TRAUTWINE, JR., was associated with me in this matter and the original suggestion emanated from him.

Yours truly,

RUDOLPH HERING.

Portland Cement Testing.

The Austrian Association of Engineers and Architects have recently published a pamphlet on a uniform system for the purchase and testing of Portland cement. In it cements are divided into quick-setting, medium and slow-setting cements. A quick-setting cement being defined as one which sets in 10 minutes in the air, the time being reckoned from the moment of adding the water, whilst those cements which take 30 minutes or more are considered slow-setting. As the time of setting may be altered by manipulating the cement, the Association has proposed the following uniform system of testing. First, to render the conditions perfectly uniform, the cement is brought to a standard consistency, and only after this has been done is any attempt made to ascertain the time of setting. This consistency is tested by determining to what depth a brass rod, 1 centimetre in diameter, penetrates into newly-mixed cement when weighted by 300 grammes, including the weight of the rod itself. This rod slides in guides to preserve its verticality, and is fitted with a scale pan at its upper extremity. The cement to be tested is inclosed in a box, the sides of which are formed by a circular ring of hard rubber, 8 centimetres in diameter by 4 centimetres high, which rests on a strong glass plate forming the bottom of the box. To use the apparatus, 400 grammes of cement are mixed with an arbitrary quantity of water, and the whole thoroughly worked with a spatula for a period of 1 minute with quick-setting cements, and 3 if slow-setting or medium cements are being tested.

The thick paste thus obtained is carefully transferred to the interior of the rubber ring, and its surface struck off level with the upper edge of this ring. The box and its contents are then placed underneath the stiffness tester and the weighted rod allowed to descend slowly into the mass. If the rod sticks in the cement at a distance of 6 millimetres from the upper surface of the glass bottom, the consistency of the cement is standard, but if not, a fresh trial must be made with cement mixed with more or less water, until this occurs, after which the hardening test can be proceeded with. For this the box is again filled with cement mixed with the proper quantity of water, as ascertained in the consistency trials, and a steel needle of square millimetre section, i. e., 1.13 mm. in diameter, is substituted for the brass rod employed in the previous experiments, weights being placed on the scale pan to again bring the weight of the whole up to 300 grammes. This needle is brought down on to the cement at frequent intevals. At first it penetrates right through to the glass, but after a short time has elapsed it sticks in the paste, and the instant that this occurs is considered the moment of the setting of the cement.

From the above it would seem that the process is somewhat tedious, especially in the case of slow setting cements. We may add that an English engineer has recently devised an automatic method of ascertaining the time of hardening. For ascertaining the binding power, the Committee recommends that experiments should be made on mortars and not on the neat cement, these mortars being prepared with a standard sand obtained as indicated below. The use of a standard sand is necessary, and very variable results will otherwise be obtained, and curiously enough, sharp sand is, in this report, stated to make a mortar having less tensile strength than one in which well-rounded grains have been used.

The standard sand recommended is a quartz sand, as pure as occurs in nature, thoroughly washed, dried, and separated from all its coarser portions by sifting through a sieve having 64 meshes per square centimetre (about 412 per sq. in.). The portion passing through is again sifted on a sieve having 144 meshes per square centimetre (about 928 per sq. in.), the portion remaining on this sieve being the standard sand. Both tensile and compressive tests should be made, as one cannot with much accuracy be inferred from the other, and cement is practically all used in compression. For tension the Committee recommend a form of briquette much inferior to that in use in this country, as the curves at the neck are much shorter radii than is common here. The area of the blocks at the neck they consider should be 5 square centimeters (0.776 sq. ins.). For compressive tests, which they consider to be the true criteria of the value of a cement, they recommend cubical specimens, the area of each face being 50 square centimetres (7.76 sq. ins.). These tests should be made at 24 days after setting, as the cement does not acquire its permanent characteristics until after this time; and where possible, tests at even greater ages should also be made. As, however, the plant required for compression tests is expensive, the uniformity of the product, after the initial experiments have once been made, can be secured by simple tensile tests in specimens of neat cement at from 7 to 28 days old.—*Engineering.*

RAILWAYS.

EAST OF CHICAGO.—Existing Roads.

Wabash.—The officers of the recently consolidated Wabash and Wabash Western railway companies are President, O. D. ASHLEY, of New York; Vice-Presidents, JAS. F. HOW, of St. Louis, Mo., and EDGAR F. WELLES, of New York; JAS. F. HOW, Treasurer, and CHARLES M. HAYS, of St. Louis, General Manager.

Flint & Pere Marquette.—A press dispatch states that this company has completed the belt line around the cities of Saginaw and East Saginaw, Mich. The line was built to afford the various manufacturing interests connection with the railways entering the cities. The road will do both a freight and a passenger business.

New York, Ontario & Western.—Ward & Leary, who have the contract for building the "zig-zag" tunnel near Franklin, N. Y., have about 300 men at work. They are now using 2 steam shovels, 2 locomotives, and 100 cars, and expect to have the work completed in about a year and a half.

Albert Southern.—The New Brunswick Government has issued a writ demanding that this road be completed within 6 months. The road was projected to run from Hopewell to Alma, N. B., about 15 miles. A subsidy of $3,200 per mile was granted by the Government, in 1884, and the road partly graded. Nothing having been done for some time, the Government proposes to complete the road as a government work, unless completed by the company within 6 months.

Housatonic.—The New Haven & Derby R. R. is marketing an issue of $575,000 of bonds, a portion of which will be used in building the road to a junction with the Housatonic R. R.

Rochester & Honeoye Valley.—This company will increase its capital stock $180,000.

Shepaug, Litchfield & Northern.—The survey has been completed for the proposed branch from New Preston to Lake Waramaug, a distance of 3¼ miles, and it is expected that construction will soon begin. The estimated cost of the branch is $70,000.

New York, Lake Erie & Western.—It is rumored that this company is considering extending the New York & Greenwood Lake R. R., from Montclair, N. J., to a connection with the Central R. R. of New Jersey, at Rockaway, N. J., a distance of about 15 miles.

Toledo, Columbus & Cincinnati.—It is announced that this road will be completed from South Findlay south, to Kenton, O., this season. J. D. WILLIAMS is Engineer in charge.

Central R. R. of New Jersey.—Surveys are reported in progress for a branch from Easton, Pa., up the Bushkill valley, to connect with the Bangor & Portland, and the Pennsylvania, Poughkeepsie & Boston railways.

Vincennes, Oakland City & Owensboro.—J. D. POWERS, who had the contract to build this road, has surrendered his contract. The company will now advertise for bids and let the contract to the lowest bidder. The road is projected to run from Vincennes, Ind., to Owensboro, Ky., a distance of 70 miles. W. C. ELLIS, of Owensboro, is Chief Engineer.

Maine Central.—WM. A. ALLEN, of Portland, Me., Chief Engineer, sends us the following data concerning the extension from Fabyan's to Scott's, N. H.:

This line, which is an extension of the Portland & Ogdensburg R. R., runs from Fabyans, via Zealand, Twin Mountain and Hazen's Mills, to Scott's Mills, a distance of 17.55 miles. The object of the road is to connect the Maine Central R. R. with the Boston & Maine system. The maximum curve is 7° and the maximum grade 1½ per cent. About 1,300 men and 200 teams are now at work on the line. A greater portion of the grading has been completed, and about 8 miles of track laid. The work is being done by the company, with WM. A. ALLEN, Chief Engineer, in charge of construction.

Projects and Surveys.

New York, Fort Wayne & Chicago.—The officers of this company, which proposes to build a railway from Fort Wayne, Ind., to Chicago, 134 miles, are: JOHN LEE, Crawfordsville, Ind., President; J. A. FINCK, Warsaw, Ind., Vice-President; A. M. PACKARD, Secretary, and M. W. SIMONS, Treasurer, both of Plymouth, Ind.

Phillipsburg & South Easton.—Incorporated in Pennsylvania to build a railway from Easton to the New Jersey boundary line, a distance of 1 mile.

Lake Hopatcong Northern.—A project is on foot to build a railway from a point on the west shore of Lake Hopatcong, N. J., near Byron's Cove, north to a connection with the New York, Susquehanna & Western R. R., at Stockholm, N. J. W. M. FORCE, of Newark, is at the head of the enterprise.

Hopewell & Van Wagner.—It is reported that the building of a railway from Hopewell, N. Y., north to Van Wagner Station, on the New York & New England R. R., about 12 miles, is under consideration.

Rangeley Lake.—Another project is on foot to open up the timber lands around the Rangeley lakes Me., to the railways. I. J. MEAD, of Boston, Putnam & Clossen, of Gardiner, Me., Gilbert Bros. & Co., and others, propose building a railway over the mountain branch of the Franklin & Megantic R. R., which is completed from Kingfield west to the mills of Gilbert Bros. & Co., and west to the Rangeley lakes. It is claimed that the line would be shorter than the proposed Phillips & Rangeley R. R., and would open up the same region.

Delaware & North River.—The officers of this company, a notice of whose incorporation was given in our issue of July 13, are: ISAAC N. COX, of Ellenville, N. Y., President; PETER E. FARNUM, of Port Jervis, N. Y., Vice-President, and CHARLES ST. JOHN, Secretary and Treasurer. The road is projected to run from Summitville, N. Y., to Kingston, N. Y., a distance of 40 miles.

SOUTHERN.—Existing Roads.

Louisville & Nashville.—The contract to build a branch from Oxmoor, Ala., to Boyle, 10 miles, has been let to J. W. Worthington & Co., Birmingham, Ala.——A 5-mile branch of the Birmingham Mineral R. R., is under construction to the Bamberger coal fields, in Alabama. J. W. Worthington & Co., Birmingham, Ala., have the contract to build the branch from Blocton, Ala., toward Helena, 30 miles.

Nashville, Chattanooga & St. Louis.—The branch from Dickson, Tenn., southwest 7 miles to the furnaces of the Warner Iron Co., of Nashville, Tenn., will be completed in a few days Davis & Canty, Nashville, Tenn., are the contractors for the grading, and J. M. Freeman for the crossties. It is stated that the company will also build a 3-mile branch from Hermitage Station to Hermitage, Davidson county, Tenn.

Knoxville Southern.—This road, running from Blue Ridge, Ga., on the Marietta & North Georgia R. R., to Knoxville, Tenn., is rapidly nearing completion. President, GEO. R. EAGER, Knoxville, Tenn.; Chief Engineer, C. R. WALTON.

Decatur, Chesapeake & New Orleans.—A report from Fayetteville, Tenn., states that in Lincoln county, 800 hands are employed in grading this road, and that work is being pushed night and day; except a few heavy cuts and the bridges, the road-bed is about completed. It is said that the route will be changed beyond Shelbyville, to run via Triune and Nolensville direct to Nashville, instead of to Gallatin, via Murfreesboro and Lebanon as was at first proposed.

Louisville Southern.—The trestle at Lexington, Ky., is now ready for the rails, and the bridge over the Kentucky river at that place will probably be finished by Aug. 15. Trains must be running between Louisville and Lexington, by Aug. 29 in order to obtain the subsidies voted by the latter city.

Central R. R. of Ga.—The Columbus & Rome R. R., will be changed to standard gauge, and several thousand new ties will be put down; it is stated that the road will be extended from Greenville to Newman, Ga., 20 miles.——On the Savannah & Western R. R., 400 men are employed west of Morrison's, Ga., and several miles have been completed.

Savannah, Americus & Montgomery.—It is stated that Brunswick, Ga., has offered $50,000 bonus if this company will make that place its terminus, instead of Savannah; also that a portion of the line in the vicinity of McRae, Ga., has been abandoned to the Central R. R. Co. of Ga., who are using it for the line of the Savannah & Western R. R.

Chattanooga Union.—A large force is at work extending the Orchard Knob division of this Tennessee road on to the Sherman Heights, 1.5 miles. The extension of the Oak Hills division to Mountain Junction, 3 miles, to connect the Broad Gauge R. R., is being rapidly pushed.

Alabama Midland.—At the annual meeting of the stockholders the old board of directors was re-elected and the following officers chosen: O. C. WILEY, Troy, Ala. President; W. R. NEWCOMB, New York City, Vice-President; W. F. JOSEPH, Montgomery, Ala., Secretary; J. C. HENDERSON, Troy, Ala., Treasurer.——Messrs. James Brown & Co., have received the contract to build the road from Montgomery, Ala., to Maplesville, about 45 miles, and they began work July 29. The bridge across the Alabama river has been purchased of the Phœnix Bridge Co., Phœnixville, Pa., and the work of erection began Aug. 6. Near Ozark, Ala., tracklaying is progressing at the rate of 1½ miles a day. J. W. PERSONS Chief Engineer, has begun the survey from Maplesville, Ala., to Tuskaloosa, about 50 miles.——The company has sued the Central R. R. Co. of Ga., for $150,000 damages for trespassing on its right-of-way from the Barbour County line to Ozark.

Chicago & West Michigan.—The following are the proposals received and opened July 15, for the construction

		J.F. Fitzgerald & Bro., Lincoln, Neb.		Williams & Co., Chicago.		Winston Bros., Minneapolis, Minn.		McDonnell Bros., Grand Rapids, Mich.		Foley Bros. & Guthrie, St. Paul, Minn.		L. C. Brooks & Co., Jackson, Mich.		McArthur Bros., St. Paul, Minn.		Sinclair & Doheny, Windsor, Ont.	
	App'x-imate quantities	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't
Clearing acres	740	$30	$22,200	$30 & $40	$26,600	$15 & $58	$30,020	$25 & $40	$25,100	$39	$28,860	$28	$20,720	$48 & $34	31,320	$40 & $18	$23,000
Grubbing stations	2,090	$12	25,080	$5 & $7	13,300	$9 & $19	33,510	$10 & $12	24,840	$16	33,440	$10	20,900	$14 & $16	32,200	$15	31,350
Earth excavation cu. yd.	850,800	18c	153,144	23½c	109,938	18c & 25c	179,100	21½c & 24c	192,192	23c	105,684	25c	212,700	18, 18½, 19c	159,006	21 & 23c	197,.38
Piles in trestles lin. ft.	21,680	25c	5,420	25 c	5,420	25c	5,420	30c & 31c	6,558	27c	5,854	28c	6,070	21c	4,553	30c	6,504
White pine timber M.B.M.	346,000	$22½	7,785	$27	9,342	$27	9,341	$33	11,418	$29	10,134	$28	9,688	$22 & $24	7,991	$30	10,380
Laying track miles	74	$145	10,730	$250	18,500	$265	19,610	$225	16,650	$260	19,240	$200	14,800	$240	17,760	$245	18,130
Ballasting track "	74	$520	38,480	$700	51,800	$700	51,800	$775	57,350	$620	45,880	$759	56,166	$1,200	88,800	$800	59,200
Total			$262,839		$324,990		$328,801		$334,108		$339,092		$341,044		$341,630		$345,772

Louisville, New Orleans & Texas.—The extension from Coahoma, Miss., south 50 miles to Rosedale, to connect with the Rosedale branch, is to be completed Aug. 31. The contractors are Fudge & Strang, from Coahoma south 25 miles, and Flynn & De Cairs for the remaining 25 miles, the latter also doing the tracklaying. The 10.5 mile connection from Hampton, Miss., on the Lake Washington branch, to Rolling Fork, on the main line, has been finished; also a branch from Slaughter, La., on the main line, to Bayou Sara, on the Woodville & Bayou Sara R. R. 1.7 miles.

Savannah, Florida & Western.—It is reported that this company will build a branch from Jesup, Ga., to Folkston, Ga., about 45 miles, and lay a double track from the latter place to Jacksonville, Fla., 41 miles. This line by connecting with the East Tennessee, Virginia & Georgia R. R. at Jesup would shorten the route to Florida several miles.

Florida Central & Peninsular.—An engineering corps under Capt. H. S. DUVAL is now making a preliminary survey of a branch from Tallahassee, Fla., to Columbus, Ga., via Concord, Ga., Lary, and Dawson, about 100 miles, which will give this system a northern outlet.

Tobacco Belt.—The following are the officers of this Florida road: L. B. PLUMER, Madison, Fla., President; R. H. MARKS, Vice President; W. S. JORDAN, Treasurer and General Manager.

Atlantic & Danville.—The Danville & East Tennessee R. R. Co. has asked Danville, Va., to subscribe $150,000 to aid in building its line. This road was chartered to extend the Atlantic & Danville R. R. westward, and is projected to run either via Madison, N. C. to a connection with the Cape Fear & Yadkin Valley R. R., and thence to the Cripple Creek extension of the Norfolk & Western R. R., or by the Danville & New River R. R. to Patrick C. H., and thence to the west. The town council, however, has declined to order an election.

Newport News & Mississippi Valley. — This company will build a branch road from Covington, Va., to Warm and Healing Springs.

Norfolk & Western. — The New River Plateau R. R. Co., chartered to extend the Cripple Creek branch of this railway from Ivanhoe Furnace, Va., to the North Carolina State line, has been consolidated with this company. The final location is now being made. George T. Mills, Pulaski City, Va., has the contract to build the road, about 61 miles long. Chief Engineer, W. W. COE, Roanoke, Va.

Lynchburg & Durham. — R. T. GLEAVES, Superintendent of Motive Power and Chief Engineer, will be acting President and General Manager, during the absence of President PETER J. OTEY.

Columbia, Newberry & Laurens. — Chief Engineer, CHAS. ELLIS, Jr., Columbia, S. C., states that 22 miles have been graded on this road, which is to run from Columbia, S. C., via Newberry, to a junction with the Georgia, Carolina & Northern R. R., near the Ennoree river, 62 miles. The Congaree Construction Co. has the contract to build the road from the 23-mile post to Newberry, about 23 miles, including the bridge over the Broad river. Surveys are to begin at once on the line from Newberry to the Ennoree river.

Seaboard Air Line.—An engineer corps under Capt. JOHN C. HOWARD is engaged in locating the Georgia, Carolina, and Northern R. R., from Abbeville, S. C., to the Savannah river, and another corps is at work between Clinton, the point to which the line is now under contract and Abbeville. The contracts will be let as soon as the survey is finished.

South Carolina.—A reorganization of this company is proposed, the Central Trust Company of New York City becoming the trustees of all the old securities, the new preferred stock being limited to $2,000,000. In case of failure to reorganize on this basis, the road is to be sold under foreclosure.

Albemarle & Pantego.—H. T. GREENLEAF, Elizabeth City, N. C., Chief Engineer of this North Carolina road, which, when completed, is to run from Mackey's Springs south to Pantego, 30 miles, reports good progress on the Pantego end of the line, which is now under construction.

East Tennessee, Virginia & Georgia.—The minority stockholders of the Memphis & Charleston Co., are trying to wrest the control of their road from this company They claim that the latter company has paid no dividends for 15 years, while either the Little Rock & Memphis R. R. Co. or the Chattanooga, Rome & Columbus R. R. Co. are ready to lease the road at a guaranteed rental of 6 per cent. They also propose to build the projected extension from Stevenson to Chattanooga.—— A contract for wharves and warehouses at Brunswick, Ga., costing about $15,000, has been let to McDermid & Ross.

East Georgia & Florida.—CHAS. H. HAMILTON, of New York, and WILLIAM F. BISHOP, of Connecticut, representing the minority stockholders of this Georgia road, have filed a petition in the Georgian Chambers asking that a receiver be appointed. This company was chartered in 1885, to build a road from Buffalo, Ga., south to St. Mary's, about 45 miles, to connect there with the Florida railroad system. The amount of stock issued was $400,000. McCracken & Co., of New York City, owned half the stock and had the contract to build the road. They sold out to the Savannah, Florida & Western R. R. Co., which company made no effort to go on with the work. It is claimed that this transaction was a contract to defeat competition and establish a monopoly, and according to the Constitution of Georgia, is void. A temporary restraining order has been granted, and the case will come before the courts next October.

Florida Southern.—At McMeekin, Fla., the grade of this road has been lessened and a side track is being built, The trestles at Okahumpka and Cedar Hill, Fla., have been filled in, and all trestles between Jacksonville and Brooksville, have been rebuilt.

Georgia, Southern & Florida.—This road is now in operation between Macon and Valdosta, Ga., 152 miles and within the next 30 days will be open to Lake City, Fla., 219 miles from Macon. It is expected to have trains running to Palatka, 285 miles, by December.

Projects and Surveys.

St. Johns & DeLand.—The location of this road has been completed. It is to run from De Land, Valusia County, Fla., to Beresford, on Lake Beresford. The maximum grade is 79-ft. per mile, and the maximum curve is 8°. It is probable that the road will be built in the near future. D. D. ROGERS, of Daytona, Fla., is Chief Engineer.

Louisville, Cincinnati & Virginia.—The various counties along the route are voting on the question of subscriptions in aid of this proposed road. The road is projected to run from Winchester to Beattyville, Ky., 50 miles. J. C. TURNER, of Winchester, is Chief Engineer.

Portsmouth, Lake Drummond & South Mills.—W. H. STEWART and others, of Portsmouth, Va., will incorporate a railway company by this name.

Alabama, Georgia & Florida.—The survey for this line has been completed from Columbus, Ga. to Quincy, Fla. It is stated that a very favorable line has been found. John L. COWAN, of Columbus, Ga., is Chief Engineer.

Fayetteville & Albemarle.—A press dispatch from Fayetteville, N. C., states that at a meeting of the incorporators, recently held, it was voted to survey a line from Fayetteville, east, in the direction of Albemarle, N. C., to a connection with the Atlantic Coast Line. JOHN MCDUFFIE, of Fayetteville, is Chief Engineer.

Montgomery & Sylacauga.—A report is in circulation that the franchises of this company which proposes to build a railway from Montgomery to Sylacauga, Ala., have been purchased by the Anniston & Atlantic R. R. Co., which will complete the road and thus secure an entrance into Montgomery, Ala.

Yadkin.—A. H. BOYDEN, of Salisbury, N. C., Secretary, writes us that that this road is to run from Salisbury, N. C., via Gold Hill, Bilesville, and Albemarle, to Wadesboro, N. C., a distance of 56 miles. The company is now waiting for Stanley and Rowan counties to vote on the subject of subscriptions. Work will commence immediately after the subscriptions are voted. THEO. F. KLUTTZ, is President.

NORTHWEST.—Existing Roads.

Milwaukee, Lake Shore & Western.—Tracklaying has been commenced on the extension from Lac de Flambeau to Hurley, Wis., 41 miles.

Pacific Short Line.—The grading has been completed on the first section of this road from Sioux City, Ia., to Plainview, Neb., and tracklaying will begin soon. Engineers are now making arrangements for locating the second division west of Plainview and contracts will, it is stated, be let at once. Elections are being held in the various towns along the route to consider the question of voting bonds in aid of the road.

Illinois Central.—The Chicago City Council has passed the ordinance for the entrance of the Chicago, Madison & Northern R. R. into the city. The road is to enter the city via Halstead street commencing near the south branch of the Chicago river and running south. The company is to build a viaduct over Halstead St. and to pay all costs of condemnation proceedings, damages to property and any other expenses which may be recovered or obtained against the city.

Chicago, Milwaukee & St. Paul.—This company is tearing up the tracks of the branch road from Emmitsburg north to Estherville, Ia., a distance of 20 miles, The road was built some time ago to head off the Burlington, Cedar Rapids & Northern R. R., then being built, but was unsuccessful. Two trains a week have been run on the road until about 2 months ago, when the line was abandoned. The people of the county have applied to the railroad commissioners to compel the road to operate the line.

Centerville, Moravia & Albia.—This road formerly operated by the St. Louis, Keokuk & Northwestern R. R., but abandoned some years ago, will it is stated, be repaired and operated by the Iowa Central R. R. The road failed to pay expenses when operated by the St Louis, Keokuk & Northwestern. It is said that the line will be extended to Glenwood, Mo., or Bloomfield, Ia.

Chicago & Northwestern.—It is rumored that this company is considering extending the Freeport branch from its present terminus at Freeport, Ill., to a connection with the main line at Gladbrook, Ia.

Chicago, Burlington & Northern.—Frank Jackson, of St. Paul, Minn., has the contract for building the transfer at Winona, Miss., and will begin work at once.

Projects and Surveys.

St. Paul, New Ulm & Southwestern.—W. C. BREDENHAGEN, of St. Paul, Minn, gives us the following data concerning this enterprise:

The surveys have been completed for the road, which is to run from Hopkins, Minn., via Chaska, Carver, New Ulm and Windom to Lake Field, Minn., a distance of 125 miles, The work will be medium. There will be only one bridge of importance. A portion of the right of way has been secured and about $40,000 local aid is expected. Negotiations are now in progress for placing the bonds.

Milbank, Egan & Sioux City.—Surveys have been commenced for this Dakota road under the direction of N. B. DARE, of Minneapolis, Minn. The road is projected to run from Milbank to Egan, Dak., a distance of 75 miles, WM. M. BROOKS, of Brookins, Dak., is President.

SOUTHWEST.—Existing Roads.

Marion Belt & Chingawassa Springs.—This road has been completed from Marion, Kan., to Chingawassa Springs, a distance of 8 miles, and has been opened for traffic. JOHN HALL, of Fort Ann, N. Y., is President.

San Antonio & Aransas Pass.—A petition has been filed praying for the appointment of a receiver for this company. The plea is that the company owes the petitioner $9,000 on a note past due; that the road is already mortgaged to the extent of $11,000,000, and that the managers contemplate selling the property at an early date.

Red River, Sabine & Western.—The citizens of Rusk and New Birmingham, Tex., have raised the $30,000 asked of them in aid of this road. The road is projected to run from Fort Worth, Tex., to Alexandria La., about 345 miles. L. W. LLOYD, of Nacogdoches, La., is President.

St. Louis, Iron Mountain & Southern.—The contract has been awarded for the 2 mile branch from a point on the Batesville branch to Sulphur Rock, Ark.

Louisville, New Orleans & Texas.—This company has received 16,000 tons of steel rail which will be used in improving the main line of the road. The track between New Orleans and Baton Rouge, 89 miles,

of the line from Baldwin to Traverse City, Mich., 74 miles.

Gamble & Granville, East Saginaw, Mich.		Lalley & Son, Detroit, Mich.		McDermid & Ross, Toronto, Ont.		E.P. Reynolds & Co., Elgin, Ill.		W. Dingman, Cadillac, Mich.		Hamilton & Webb, Toledo, O.		Shepard, Siems & Co., St. Paul, Minn.		Dewey & Hebron, Chicago, Ill.		P. Brennan & Son, St. Paul, Minn.		G.T. Wiswell, East Saginaw, Mich.		T. M. Nelson, Chicago, Ill.	
Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't	Bid	Prod't
$75	$55,500	$40	$29,600	$35 & $30	$24,400	$75	$55,500	$35	$25,900	$32½ & 25	$21,800	$35	$25,900	..	..	..	..	..	..	..	..
$6	12,540	$9	18,810	$9 & $7	17,570	$25	52,250	$4.85	10,136	$11 & 9	21,750	$16	33,400	.....	.....	.....	.....	.....	.....	.....	.....
23½c	199,958	27c	2,9,716	27 & 26c	224,916	28c	238,224	30c	170,160	23c & 21	186,084	22c	187,176	.....	.....	.....	.....	.....	.....	.....	.....
30c	6,504	33c	7,154	28c	6,070	38c	8,238	20c	4,336	25c	7,588	30c	6,504	.....	.....	.....	.....	.....	.....	.....	.....
$28	9,688	$33	11,418	$25	8,650	$28	9,688	$24	8,304	$32½	11,245	$27	9,341	.....	.....	.....	.....	.....	.....	.....	.....
$300	14,800	$365	19,610	$250	18,500	$350	25,900	No bid	.....	No bid	.....	$275	20,350	$275	$20,350	$255	$18,130	$250	$18,500	$230	$17,020
$650	48,100	$700	51,800	$750	55,500	$650	48,100	"	.....	"	.....	No bid	.....	439	32,486	645	47,730	$675	49,950	740	51,800
	$347,070		$368,108		$355,606		$437,900		$218,836		$248,467		$282,711		$52,836		$65,860		$65,860		$68,820

has been entirely relaid with 62-lb. steel rail. About 650,000 new cross-ties have been used.

Texarkana & Shreveport.—It is stated that the contract has been let for the completion of this road to Sulphur Station, on the International & Great Northern R. R., a distance of about 10 miles. The Gate City Lumber Co., of Texarkana, Ark., is at the head of the enterprise.

Louisiana North & South.—The contract has been let, and work is now in progress for the extension from Gibsland, La., south toward Sparta, 4 miles. The contract for the remaining distance to Sparta, about 16 miles, will be let soon. The line from Homer north to a connection with the St. Louis, Arkansas & Texas R. R. will not be built until the above division is completed.

Chicago, Kansas City & Texas.—Arrangements are reported completed for the extension of this road from Smithville, Mo., to Edgerton, and thence ultimately north to a connection with the St. Joseph, St. Louis & Santa Fé R. R., over whose tracks it will enter St. Joseph, Mo. W. E. WINNER, President of the Winner Investment Co., of Kansas City, Mo., is at the head of the enterprise. Construction is now in progress between the present terminus and Smithville.

Cape Girardeau & Southwestern.—It is announced that this company has made a proposition to build a railway from Cape Girardeau to Perryville, Mo., about 40 miles, on condition that the people along the route raise $25,000 in aid of the enterprise. It is thought that the amount will be raised.

Projects and Surveys.

Chicago, Kansas & Arkansas.—We have received the following information from WALTER G. SEAVER, of St. Joseph, Mo., Secretary:

The road is projected to run from St. Joseph, Mo., via Lawrence, Kan., Neosho, Mo., and Ft. Smith, Ark., to Texarkana, Ark., with branches from Oskaloosa, Kan., to Arkansas city, Kan., and from Mound City, Kan., to Springfield, Mo., a total distance of about 550 miles. The line has been located from St. Joseph to Van Buren, Ark., and a preliminary line has been run for the remainder of the distance. The work will be generally light. The principal business will be in timber, coal, cotton, live stock, farm produce and minerals. About 170 miles of right of way has been secured and nearly $1,000,000 local aid obtained. Negotiations are now pending for the sale of the bonds. The company was incorporated in June, 1887. JOSEPH HANSEN, of St. Joseph, is President.

Texas Midland.—W. A. TAYLOR, of Waco, Tex., President, sends us the following information:

The road is projected to run from Waco east via Mexia, Fairfield, Palestine, Rusk, New Birmingham and Carthage to Shreveport, La., a distance of 243 miles. The surveys for the entire line have been completed. The road will cross the Houston & Texas Central R. R. at Mexia, the International & Great Northern R. R. at Palestine and make connections with the Queen & Crescent and the Texas & Pacific Rys. at Shreveport. The work will be light; earth excavation and embankment being about 8,000 cu. ft. per mile; maximum grade 1 per cent. About $.50,000 local aid has been secured. STEPHEN TURNER is Chief Engineer.

Brighton & Lansing.—Incorporated in Kansas to build a railway from Brighton to Lansing, Leavenworth county, a distance of 4 miles. Among the directors are A. EVANS, of Eureka, Kan., and J. W. CRANCER and E. GREGORY, both of Leavenworth, Kan., where the headquarters of the company will be located.

ROCKY MT. AND PACIFIC.—Existing

San Francisco & North Pacific.—The narrow gauge line running from Ignacia to Glen Ellen, Cal., 26 miles, is to be changed to standard gauge. It is expected that the work will cost $70,000. A $10,000 draw-bridge will be built at Norfolk.

Silverton.—At the annual meeting recently held, the following officers were elected: President, OTTO MEARS; Vice-President, JOHN A. PORTER; Treasurer, JOHN MCNEIL; Secretary, JOHN W. WINGATE, and Chief Engineer, C. W. GIBBS. It was voted to extend the road from Silverton to Eureka, Colo., immediately.

Seattle, Lake Shore & Eastern.—Work is being pushed on the construction of this road. Track is being laid on Jones & Bro.'s contract from Hop Ranch to a point 6 miles beyond. Earl & McCloud and Edward Hall Warner, have contracts for 10 miles each. It is expected complete 15 miles of the British Columbia branch efore winter.

Astoria & South Coast.—This company has filed supplementary articles of incorporation providing for the construction of several branch lines in Oregon. The directors are, FRANK J. TAYLOR, D. R. WARREN, C. W. FULTON and others.

Denver & Rio Grande.—Engineers are now at work making the final location for the proposed road up Pike's peak, and it is stated that grading will begin at once.

Burlington & Missouri River.—Press dispatches from northwestern Colorado report parties of engineers stated to be in the employ of this company as making surveys along the Poudre cañon.

St. Paul, Minneapolis & Manitoba.—The engineers have completed the surveys for a branch running from some point on the Sand Coulee branch of the Montana Central R. R. to Neihart, Mont., and are at work on a line from the Smelter branch to Neihart. It is probable that the latter route will be chosen. Grading will, it is stated, soon commence on the proposed branch, which is about 50 miles long, and will connect Great Falls with the Belt mountain mining regions.

Northern Pacific.—About 150 ft. of the tunnel on the Gallatin-Butte branch has been excavated, and work is being pushed night and day. Mathews Bros. & Co., who have the contract for the bridge work and buildings, have the work well advanced for the trestle across the Silver Bow creek. The grading is well advanced, and tracklaying will soon begin at both ends of the line. Considerable difficulty is being had in obtaining right of way into Butte, Mont.—The Central Washington road from Davenport to Almira, W. T., has been placed under contract. The contractors are Woods, Larsen & Co., of Helena, Mont.—Over 25 miles of the line, from Missoula to Mullan, Idaho, a distance of 125 miles, has been located and surveys are now in progress.—Surveyors are now locating the line from Billings to Fort Benton, Mont., 225 miles, and contracts will, it is stated, be let soon.

Fairhaven & Southern.—A report is in circulation that the stockholders of this company have obtained a majority of the stock of the New Westminster Southern R. R., and will consolidate the two roads, forming a through line from New Westminster, B. C., to Portland, Ore. About 15 miles of grading has been completed from New Westminster south, and work is in progress on the Fairhaven & Southern road.

Oregon Railway & Navigation Co.—The grading on the line between Rockford and Spokane Falls, W. T., is well under way, and the ties and trestles in place for a distance of 10 miles. About 9 miles of track has been laid on Mullan branch, and work is being pushed on the remaining 14 miles to the St. Joe river. Grading has been completed to Wallace, Idaho, and work is now in progress from Wallace to Mullan.

Seattle & Northern.—About 1,000 men are now at work on this road and 20 miles of grading has been completed. The work has been very heavy, the route being through a rough, heavily timbered country. Capt. F. A. HILL has charge of the construction.

Union Pacific.—The consolidation of the Oregon Short line, the Utah & Northern, the Utah & Nevada, the Salt Lake & Western, the Ogden & Syracuse, and the Nevada Pacific railways into one corporate organization, to be known as the Oregon Short Line & Utah Northern R. R., has been completed. The officers are: President, CHARLES FRANCIS ADAMS; Vice-President, WM. H. HOLCOMB; Second Vice-President, GARDINER M. LANE; Treasurer, JAS. G. HARRIS; Assistant Treasurer, LUTHER S. ANDERSON; and Secretary, ALEX. MILLAR.

Southern Pacific.—The bridge on the Northern California R. R., across the Sacramento river at Knight's Landing, is nearly completed. About 300 teams are now at work between Knight's Landing and Maryville. About 9 miles more of the line remains to be completed to connect the line with the Rideout extension. There will be a large amount of trestle work.

Tacoma, Olympia & Chehalis Valley.—Contracts for grading 25 miles of this road have been let and work is now in progress. About 7 miles of the grading has been completed.

Projects and Surveys.

Tacoma, Olympia & Pacific.—Incorporated in Washington Territory, to build a line of railway from a point on the Northern Pacific R. R. to Olympia and thence running in a southwesterly direction to Gray's Harbor. Among the incorporators are: N. H. OWINS, of Olympia, W. T., WM. H. CALKINS, HARRY A. CLARK, and A. MCKINNON, all of Spokane Falls, W. T. The principal offices will be at Olympia.

San Juan & Southern.—This company has been chartered in Colorado, to build a railway from Dallas to Rico, Col., a distance of 60 miles. The object of the road is to open up the mines at Telluride and Rico. The officers are: DAVID WOOD, President; T. B. TOWNSEND, Vice-President; and C. E. MCCONNELL, Secretary and Treasurer.

Seattle Central.—This company has been organized, and will soon file articles of incorporation empowering it to build a railway from a point on Union Bay, in the City of Seattle, W. T., north to Dunlap's, a distance of about 12 miles. The road will do a suburban passenger business mainly. A. C. THOMPSON, of San Francisco, Cal., is President of the company.

FOREIGN.

Bahia Blanca & Northwestern.—This company has been organized to carry out a concession for a railway running from the port of Bahia Blanca to the towns of Villa Mercedes and Rio Cuarto, Argentine Republic, a distance of 738 miles. John G. Neggs, Son & Co., of London, have the contract for building and equipping the line.

Monterey & Northwestern.—Articles of incorporation have been filed empowering this company to build a railway from Monterey, state of Nuevo Leon, northwesterly through the states of Nuevo Leon, Coahuila and Chihuahua, with necessary branches. Among the incorporators are THOS. S. BULLOCK and FRANCIS C. B. AVERY, of New York, and VICTOR A. WILDER, of Brooklyn, N. Y.

Deming, Sierra Madre & Pacific.—About 5 miles of this road has been graded from Deming, N. M., south. Work is also being pushed on the Sonora, Sinaloa & Chihuahua R. R. under which name the Mexican portion of the road is being built. Elliott Huse & Co., of Chicago are the contractors.

RAPID TRANSIT.

Elevated Railway. ***St. Louis, Mo.***—The Scott elevated railway bill has passed the House of Delegates, and it is expected it will be signed by the Mayor. The road will be 17 miles long and will cost about $9,000,000.

Cable Railways. ***Denver, Col.***—The South Denver Cable Ry. Co. has applied for right of way and proposes to build its line at once.—The Bowman Still Cable Ry. Co. will give an exhibition of its system. The cable is at rest, but passes over pulleys attached to the car, these pulleys being operated by steam power.

San Francisco, Cal.—The California Street Cable Ry. Co. will built a double-track extension 10,750 ft. long. The Pacific Rolling Mills have the contract for rails, and the Judson Iron Works for yokes. The engines will be of 600 H. P.

Street Railways.—***Buffalo, N. Y.***—The franchise for a street railway on Clinton St. has been sold to the West Side St. Ry. Co. at its bid of ⅛ of 1 per cent. of the gross receipts.

Jackson, Mich.—The Jackson St. Ry. Co. has decided to build an extension of 1½ miles.

Sterling, Ill.—The Union Street Ry. Co., of Sterling and Rock Falls, has increased its capital stock from $35,000 to $125,000.

Houston, Tex.—The Chicago syndicate, headed by Mr. HOLMES, which has secured control of the street railway system, proposes to build considerable extensions.

Street Railways.—***Newport, R. I.***—The electric railway was opened last week.

Pittsburg, Pa.—The Sylvan Street Ry. Co. has been incorporated by JOSEPH M. WILSON, W. W. MURRAY, H. T. ROMLEY, DAVID MOORE and ROBT. S. FRAZIER. Capital stock, $24,000.—The Swissvale & Wilkinsburg Street Ry. Co. has been incorporated by the same parties. Capital stock, $53,000. Both of the lines are to be operated by electricity.

Chattanooga, Tenn.—The Chattanooga & Floral Park Street Ry. Co. has been incorporated to build an electric line to Sherman heights.—A controlling interest in the City Street Ry. Co. has been purchased by C. A. LYNDLY

E. WATKINS, and SAM. W. DIVEN for $450,000. The company operates 5 lines, aggregating 21 miles, and 10 miles of extensions are to be built. The Sprague electric system will be adopted.

Frankfort, Ky.—Parties who hold a charter for a street railway are now proposing to adopt electric traction, taking power from the electric light station.

Athens, Ga.—Propositions for the electrical equipment of the street railway, are asked for by E. G. HARRIS, of Macon, Ga.

Augusta, Ga.—The Augusta & Summerville Ry. Co. has applied for power to adopt electric traction.

Hamilton, O.—The Hamilton Street Ry. Co. proposes to improve its road and operate it by electricity. The plant will be driven by water power.

Cincinnati, O.—The electric line on Colerain Ave., between Brighton and Cumminsville, has been opened for traffic. It is 2.66 miles long, with a maximum grade of 3 per cent., and is operated on the Thomson-Houston electric system. There is a 400-H. P. Corliss engine, and 2 Ball engines of 200 H. P.

HIGHWAYS.

Extension of Time in Letting.—Contractors will please note that all the Union County, N. J., roads to be macadamized are advertised this week, and that the date the contract was awarded did not produce bonds satisfactory to the freeholders. The bond has been made of letting has been extended to Aug. 27. The St. George's road has been readvertised, as the party to whom lower in amount, thus opening up farther competition. The specifications, with this exception, remain unchanged.

We think there is an opportunity here for contractors to make some money.

A Long Island Turnpike.—The North Hempstead turnpike will not be macadamized this year. The long-desired improvement has been necessarily postponed, and for another winter and spring the farmers of the north shore of Long Island will have to drag their loaded wagons through the mud of one of the worst thoroughfares in the State of New York.

The turnpike was owned for many years by the Flushing & North Hempstead Turnpike Co. and kept in a condition of disrepair that was outrageous and disgraceful. The condition of the road after the blizzard of 1888 was so utterly bad that in the town election that year the resolution to purchase the turnpike was carried without demur. The removal of the tollgates was the first visible evidence of improvement that followed the acquisition of the road by the town, but the thoroughfare was in such bad condition that ordinary expenditures were simply wasted in the effort to put it in good repair. At the last spring election a resolution to appropriate $40,000 for the macadamizing of the turnpike was passed by a large majority in spite of the strenuous opposition of the Hyde Park and East Williston voters. The town board advertised for bids, but the lowest received exceeded by $38,000 the amount appropriated for the purpose, and the board has decided to refer the whole matter to the voters at the next town election, and leave it for them to say whether the larger appropriation shall be made.

North Hempstead is rich enough to have good roads. The macadamizing of the turnpike would be worth far more than its cost to the farmers and property owners of the town.—*Brooklyn Times.*

Roads.—The following proposals for regulating, grading and telford and macadam paving on the Flushing and North Hempstead turnpike, have been received by the Town Board at Roslyn, N. Y.: Dutton & Willets (withdrawn); T. W. Willets, North Hempstead, $17,287 for station 0 to 63½, $39,670 from 151 to 293¼; Bernard Malon, New York, $17,800 from station 0 to 63½, $38,800 from station 151 to 293¼, $78,000 for the whole work. The bids were rejected, and the board now proposes to advertise for bids to do the work at so much a yard, the work to begin at the Flushing township line and to proceed as long as the appropriation lasts. For particulars address S. HOOPER, Town Clerk, Roslyn, L. I.

The bids for paving St. George's Ave., between Rahway and Elizabeth, have been opened by the Board of Freeholders, at Newark, N. J. The specifications called for 7,000 cu. ft. of earth excavation and 29,336 sq. yds. of macadam or telford pavement. Wm. H. Adams, of New York, $36,405; C. F. Mairs, of New York, $43,799; and B. M. & J. F. Shanley, of Newark, $55,618.

The Commissioners of Baltimore county, Md., will have repairs made to the roads damaged by the recent storms.

The contract for a road from the Chesapeake & Ohio Ry. to the U. S. barracks at Newport, Ky., has been let to E. A. Hicks at $10,489.

Toll Roads.—The people of Union township, Ind., have voted in favor of the proposition to purchase the toll roads under the plan of the new law. The total number of miles in Union township is 41.7 miles, valued at $28,432; in Ripley township, .84 mile, and in Wayne township, 6.35 miles. The total value in the county is $32,689.50, which is the full amount that is asked for the roads. The total length of these roads is 48.84 miles, and the average price per mile is $627.77. There is a piece of road 3.95 miles in length in Franklin township which the gravel road company refused to sell at the price named $500. Wayne and Ripley townships voted against the proposition.

CONTRACTING.

Levee.—The Commissioners of the Cairo Drainage District, at Cairo, Ill., have awarded the contract for the Cache levee to Thos. Little, of Illinois, and J. C. Neely, of Bardwell, Ky. The levee will be 6 miles long, protecting 6,000 acres of bottom land, and will cost about $60,000, or $100,000 including work on the railway embankments, sewer outlets, etc.

Dredging.—The contract for dredging Staten Island Sound, opposite the Elizabethport coal docks, has been awarded by the Government to Capt. Thomas H. Benton, of Elizabeth, N. J. There has been $15,000 appropriated for the work. Capt. Benton will dig out the channel to the depth of 13 ft.; it is 11 ft. deep at low water at present.

Court House.—The contract for the Edmunds county

Lock.—The following proposals for building Lock No. 8 of the Great Kanawha river improvement, were opened by Col. WM. P. CRAIGHILL, U. S. Engineer Office, Charleston, W. Va., July 30.

Work	Approximate Quantities	Hoag & Petitdidier, Pittsburg, Pa.		C. I. McDonald Pittsburg, Pa.		Samuel R. Cochran, Greenville, Pa.		Carkin, Stickney & Cram, East Saginaw, Mich.	
		Bid	Amount	Bid	Amount	Bid	Amount	Bid	Amount
Grubbing and clearing, complete	.....	$	$100	$	$100	$	$2,000	$	$2,000
Crib logs in cofferdam, per lin. ft.	36,000	.15	5,400	.18	6,480	.25	9,000	.28	10,080
Sheathing, per 1000 ft. B.M	24,000	30.00	720	30.00	720	50.00	1,200	30.00	720
Cofferdam filling, per cu. yd.	5,700	.60	3,420	.60	3,420	1.00	5,700	.70	3,990
Excavation "	19,000	.85	16,150	.75	14,250	1.00	19,000	.60	11,400
Excavation, rock "	1,200	2.60	3,120	5.00	6,000	2.50	3,000	4.00	4,800
Embankment "	7,500	.40	3,000	.40	3,000	.25	1,875	.55	4,125
Puddling "	400	1.50	600	.75	300	1.00	400	1.60	640
Concrete "	500	7.00	3,500	6.00	3,000	7.00	3,500	5.50	2,750
Backing masonry "	4,600	7.50	34,500	6.75	31,050	9.50	43,700	7.00	32,200
Rock face masonry "	1,200	10.00	12,000	8.00	9,600	9.50	11,400	9.00	10,800
Pointed face masonry "	1,550	12.00	18,600	10.00	15,500	9.50	14,725	10.00	15,500
Cut stone masonry "	300	15.00	4,500	12.50	3,750	9.50	2,850	12.00	3,600
Sills "	180	20.00	3,600	18.00	3,240	9.50	1,710	20.00	3,600
Quoins "	60	20.00	1,200	26.00	1,560	9.50	570	25.00	1,500
Coping "	390	14.00	5,460	16.50	6,435	9.50	3,705	25.00	9,750
Stone filling "	2,500	1.35	3,375	2.00	5,000	1.50	3,750	1.70	4,250
Riprap, hand placed "	1,800	2.00	3,600	2.50	4,500	2.50	4,500	3.25	5,850
Paving "	700	4.00	2,800	5.50	3,850	3.00	2,100	5.25	3,675
Timber in permt. construction, per 1000 ft B. M.	50,000	30.00	1,500	38.00	1,900	35.00	1,750	40.00	2,000
Bolt holes in masonry, per lin. ft.	1,200	.40	480	.40	480	.25	300	.50	600
	Totals	.....	$127,625	.....	$123,935	.....	$136,735	.....	$133,830

court-house at Ipswich, Dak., has been let to Harry Phillips, of Huron, at $12,000.

Jail.—The contracts for the new city jail at Meridian, Miss., have been let to Geo. S. Covert for the building, and F. Hull, of Jackson, for the iron and steel cell work.

Stone and Piles.—The following contracts have been awarded by the Docks Commissioners, New York: John A. Bouker, 600 cu. yds. of small cobble stone at 95 cts per cu. yd.; Brown & Fleming, 4,000 cu. yds. of cobble stone at 95 cts. and 2,000 cu. yds. of riprap stone at 58 cts. A. J. Murray, 150 piles 50 to 60 ft. long, at $7 each.

Cement.—The following proposals for Portland cement for the Congressional Library building have been received by BERNARD R. GREEN, Engineer and Superintendent, Washington, D. C.: Emil L. Ross, New York, $3 per bbl. or $2.80 if duty is remitted; H. L. Cranford, Washington, $3 for Hones Bros. brand or $3.30 for Dyckerhoff; J. G. and J. M. Waters, Washington, $2.75 for Battenberger; J. H. McGill, Washington, $2.58. The contract was awarded to the latter.

The following proposals for 500 bbls. of quick or slow setting Portland cement have been received by the Docks Commissioners, New York City: Haebler & Co., $2.30 per bbl.; James Brand, $2.35; Dickinson Bros. & King, $2.38; Marcial & Co., $2.50; Sinclair & Babson, $2.55. The contract was awarded to Haebler & Co.

Jetty.—The following proposals for constructing a jetty in the Trinity river have been received by Major O. H. ERNST, U. S. Engineer Office, Galveston, Tex.: Benj. F. Hutches, Jr., Galveston, $2.73 per lin. ft.; B. J. Hughes, Galveston, $2.89; S. H. Merrill, Galveston, $2.95; Chas. Clarke & Co., Galveston, $2.99; Casey & Garthar, Galveston, $3.42; Isaac Heffron, Galveston, $3.62; E. H. Sterrett & Co., Houston, $4; John Hogan, Mobile, Ala., $4.36; J. L. Purple & Co., Washington, D. C., $5.90.

Street Work.—*Sharon, Pa.*—The following proposals for vitrified fire brick paving have been received by T. B. BEIL, Secretary of the Borough: J. M. McMilland and Sam Moorehead, New Castle, $1.21; J. V. Rose, Sharon, $1.22; Thos. Connell, Youngstown, O., $1.34; J. B. Finch & Co., Youngstown, $1.36, and $1.40 with foundation; E. J. Davis and H. Caldwell, Youngstown, $1.37, $1.39 or $1.44 with different quality of brick; J. M. Todd, Wheeling, W. Va., $1.50. The contract was awarded to J. V. Rose. The contract for curbing was let to W. McIntyre, of Sharon, at 34 and 38 cts. per ft. for 24 and 30 ins. deep.

Bellevue, Ky.—A contract has been awarded to John Trapp, of Newport, Ky., at 16 cts. per cu. yd. for excavation, 40 cts. per ft. for curbing, 74 cts. per sq. yd. for paving, 69 cts. per perch for gravel, 30 cts. per lin. ft. for flagging, $1.30 and $1.60 for 20 and 24-in. sewer pipe, $4.50 per perch for stone masonry, 4 cts. per lb. for catch basins, $3.50 per cu. ft. for lumber. Total, $8,929.50. J. D. ELLIS, of Newport, is the engineer. CHAS. L. HARRISON, Town Clerk.

Topeka, Kan.—Contracts for grading alleys have been let at 12, 18.7, and 25 cts. for earth, and 73 and 75 cts. for rock.

Nebraska City, Neb.—The contract for brick paving has been awarded to B. P. Egan, at $1.95½ per sq. yd., and for curbing to Tobe & Thorpe, of Council Bluffs. The brick is to be manufactured in the city.

Paris, Tex.—Williams & Dickson have received the contract for bois d' arc paving on South Main St., at $1.25 per sq. yd., and Bonham St., at $1.20.

Asphalt Paving.—At Buffalo, N. Y., the contract for paving on Genesee St. has been awarded to the Barber Asphalt Paving Co., at $17,636.—At Newark, N. J., the contract for paving on Broad St. has been let to the Barber Asphalt Paving Co. at $2.80 per sq. yd. The New Jersey Asphalt Co. bid $3.15, the Warren-Scharf Asphalt Co. $3.24.

Sidewalks.—The following proposals for 50,000 sq. ft. of flagging walk, and 40,000 sq. ft. of brick sidewalk, have been received by Capt. GEO. E. POND, U. S. A., Fort Riley, Kan., McCarthy & Baldwin, Washington, D. C.: 36 cts. per sq. ft. for Manhattan stone flagging, 10½ cts. for brick sidewalk, 26 cts. for artificial stone sidewalk, 90 cts. per ft. for box gutter.

Schillinger Fire Proof Cement & Asphalt Co., New York, 40 cts. per sq. ft. for artificial walls; Kansas City Stone Co., 23 cts.; J. C. Meacham, Atchison, Kan., 25 and 32 cts.; Haswell T. Ternist, 20 cts.

W. J. Gilfillan, Leavenworth, Kan., 25 cts. for Fort Scott flagging; C. D. Dixon, Allegheny, Pa., 30 cts. for vitrified brick, 60 cts. for artificial stone; John Grant, Omaha, Neb., 30 35 or 40 cts. for 4, 5 or 6-in. Grant's Slagolithic; P. A. Keating, Kansas City, 15 cts. for artificial stone, 16¼ cts. per brick.

J. C. Reagan & Co., St. Joseph, Mo., 25 cts. for artificial stone, 35 or 40 for Kansas or Missouri brick, 14 cts. for labor of laying flagging: Kansas City Granite Tile Co., 18 cts. of brick, 27½ cts. for artificial stone; Uirich Bros., Manhattan, Kan., 19 cts. for Manhattan flagging; Henry Bennett, Topeka, Kan., 17 cts. for brick, 28 cts. for artificial stone, 15 cts. per cu. ft. for rubble masonry for drains; W. W. Cook, Junction City, Kan., 16¾ cts. for brick; Zeigler & Dalton, Junction City, Kan., 16¾ cts. for brick, 7¾ cts. for labor laying stone.

Cleveland Stone Co., Cleveland, O.; 3-in. sawed or split Berea flagging, 9 or 6¼ cts. at quarry, 19 or 15 cts. f. o. b. Kansas City, 23 or 20 cts. f. o. b. Fort Riley, 30 or 27 cts laid. Bandera Flagstone Co., Fort Scott, Kan., 19½ cts. per sq. ft. for Bandera flagstone, 6½ cts. for laying; 7½ cts. for flagstone instead of brick walks.

PROPOSALS OPEN.

Submarine Cable.—Between Brazil and the United States. The BRAZILIAN CONSULATE, 24 State St., New York City.

Pipe Laying.—Laying water mains. THE COMMISSIONER of PUBLIC WORKS, 31 Chambers St., New York City. August 13.

Street Lighting.—CHARLES RIEF, Chairman of Light and Sewerage Committee, Grand Island, Neb. August 14.

Street Work.—Grading, curbing, gutters and sidewalks. A. BURNETT, City Clerk, Washington, O. August 14.

Street Work.—Belgian block paving and blue stone curbing; granite block paving. JOHN P. ADAMS, Commissioner of City Works, Brooklyn, N. Y. August 14.

Grading.—Road on Tyrone Hill. About 5,000 cu. yds. of earth; average haul 1,500 ft.

Water-Works and Electric Lighting.—For Campbellford, Ont. Consulting Engineer, JOHN GALT, 53 King St. Toronto. DANIEL KENNEDY, City Clerk, Campbellford, Ont., Canada. August 15.

Water-Works. Reservoirs, pipe laying, etc. R. H. STRATTON, Chairman of the Water Committee, Gordonsville, Va. August 16.

Pipe Laying, and Lead.—Excavating and filling about 30 miles of trenches. Also 82,000 lbs. of pig lead (bids to be accompanied by a quantitative analysis.) Plans and pecifications on file. WILLARD SMYERS, Secretary, Hamilton Gas Works, Hamilton, O. August 20.

Water-Works.—Supply to be taken from Yamhill river and pumped by steam power; daily capacity 500,000 galls; ¼ mile of 8-in. and 5,000 ft. of 2, 3, 4 and 6 in. distributing pipe. Total cost not to exceed $20,000. CHARLES GRISSEN, Chairman of Water Committee, McMinnville, Ore. August 20.

Roads.—At the East Branch and Bog Brook reservoirs. The AQUEDUCT COMMISSIONERS, 280 Broadway, New York City. August 21.

Street Work.—At Clifton. Engineer, A. S. HOBBY, 227 Main St., Cincinnati. S. G. STERLING, Village Clerk, Clifton, O. August 24.

Bridges.—Segmental steel arch bridge over Mill creek at Colerain St. Masonry substructure. Wrought iron bridge over Muddy creek at Addyston. The COUNTY COMMISSIONERS, Cincinnati, O. August 24.

Gas Apparatus.—Retorts, valves, engine, gas holder, tank, etc. WILLARD SMYERS, Secretary, Hamilton Gas Works, Hamilton, O. August 27.

Dredging.—In Currituck Sound, N. C. Lieut. G. J. FIEBEGER, U. S. Engineer Office, Newport, Va. August 28.

Electric Lighting.—For the State House. Hon. WM. HIGGINS, Secretary of State, Topeka, Kan. August 28.

Pier.—Ice pier in the Ohio river at Portsmouth, O. Lieut. LANSING H. BEACH, U. S. Engineer Office, Cincinnati, O. September 2.

Jail.—The COUNTY SUPERVISORS, San Joaquin, Cal. September 23.

MANUFACTURING AND TECHNICAL.

Car-Lighting.—The Safety Heating & Lighting Co. is about to erect a large manufacturing plant in Chicago to supply the Pintsch system of lighting passenger cars by compressed gas. The officers of the company report that the Wabash vestibule trains between Chicago and St. Louis, are to have 27 cars so fitted out; the Chicago and Cincinnati vestibule trains will have 25 cars; the Chicago, Rock Island & Pacific Ry. Co., 28 cars; the Lake Shore Ry. Co., 20 cars; the Wagner Palace trains 36 cars, and 18 Pullman cars on the Erie R. R., all to be equipped with this system. At the present date over 31,000 passenger cars and 2,400 locomotives, in Europe and America, are reported as using this light. Mr. A. W SOPER, President of the company, was formerly Genera Manager of the Iron Mountain Ry., and Col. ROBERT ANDREWS, the Vice-President, was formerly General Superintendent of the Wabash Ry.

Worthington Engines.—At the Paris exposition there are 11 installations of these engines, comprising 23 Worthington pumps in operation or on exhibition, and including a high duty engine of 6,000,000 galls. daily capacity. The engines pump the water supply for the exposition and also for the Edoux elevators at the Eiffel tower, forcing water to the top of the tower, 984 ft.

Car Ventilation.—R. M. PANCOAST, of Camden, N. J., has designed a car for fruit and all kinds of green produce, in which light is totally excluded, and a current of cool fresh air kept up, so as to prevent the heating of the freight and to keep it in good condition during transportation.

Steel Works.—The Michigan Steel Works, of Detroit, are operating a plant on the Bookwalter-Robert process.

The Henderson Steel & Mfg. Co., of Birmingham, Ala., has awarded the contract for building its plant to Bogan & Wellman, of Boston, Mass.

Spiral Pipe.—The Spiral Weld Tube Co., of New York, has been awarded a contract to furnish 60 miles of gas mains for Toledo, O.

The Capital City Vitrified Brick & Paving Co. has been incorporated at Topeka, Kan., by A. M. COVILLE, WILLIS EDSON, JOHN RITCHIE, and others. Capital stock $30,000.

Railway Gates.—The Edmundson Railway Gate Co. has been organized at Richmond, Va., to control the patents of E. L. EDMUNDSON. President, ASHTON STARKE; Secretary, B. C. WHERRY. Capital stock, $30,000.

Rail Joint.—The Dunham Mfg. Co., of Boston, Mass. has purchased a controlling interest in the double-angle bar joint invented by Mr. J. W. CLOUD. The bars are of extra depth, having a vertical web projecting below the rail flange, these webs being bolted together. This form of bar, but without the bolts through the lower web, is in use in Europe, India, and Australia.

The Ball Engine Co., of Erie, Pa., reports recent sales of 24 engines, of 25 to 150 H. P., to street railway, electric

Traction Increaser.—The Philadelphia & Reading Ry. is said to be experimenting with an electric apparatus which, it is claimed will prevent the driving wheels of a locomotive from slipping on grades. The arrangement consists of a small dynamo run by the engine. The current generated passes around the drivers and magnetizes the rails at the point of contact.

Locom tives.—The Baldwin Locomotive Works, of Philadelphia, Pa., are very busy with large orders. They have turned out 4 of 25 engines for the Texas & Pacific; and have an order for 75 engines for the Northern Pacific. A narrow gauge engine has been built for R. H. Coleman, of Lebanon.

H. K. Porter & Co., of Pittsburg, Pa., have built a logging engine, weighing 11 tons, for the Wilson Lumber Co., of Wilson, Ala.

The Rhode Island Locomotive Works, of Providence, R. I., have an order from the New York, Providence & Boston, for a Forney engine for suburban passenger traffic, and a heavy freight engine.

Dewey Bros., of Goldsboro, N. C., have built a locomotive for the Enterprise Lumber Co.

The New York Central & Hudson River Ry. will let contracts for 50 freight engines, with 6 wheels coupled, and cylinders 19 x 25 ins., weighing 60 tons each; 5 passenger engines for the Harlem Division, eight-wheel type, cylinders, 17 x 24 ins. weighing 42½ tons each; and one dummy engine, for hauling freight cars on the streets tracks in New York.

Cars.—The Minnesota Car Works, of Duluth, Minn., has an order for cars for the Iron Car Co., of New York.

The Ohio Falls Car Co., of Jeffersonville, Ky., has an order for 100 freight cars for the South Atlantic & Georgia.

The St. Charles Car Co., of St. Charles, Mo., has a contract for 6 passenger cars and 225 freight cars for the Central Iowa.

The Richmond & Danville Ry. Co. has this year given out the following orders: Pullman Co., 420 box cars; South Baltimore Car Co., 500 box and 200 stock cars; Tredegar Co., 300 cars; U. S. Rolling Stock Co., 500 double hopper coal cars, 100 coke and 70 platform cars. All the box and stock cars will be equipped with air brakes and M. C. B. standard couplers, and the open cars will be equipped with M. C. B. couplers; 400 of the box cars and all the open cars will be of 60 000-lbs. capacity. The balance will be of 40,000 lbs. capacity.

Snow Ploughs.—The Rogers Locomotive & Machine Works, of Paterson, N. J., have an order from the Jull Mfg. Co., of Brooklyn, N. Y., to build 10 Jull centrifugal snow excavators. This machine was described in ENGINEERING NEWS, March 30 and April 27, 1889.

The Carolina Oil & Creosote Co., of Wilmington, N. C., held its annual meeting, Aug. 1, and elected the following officers: President, Hon. WARNER MILLER, of New York; Secretary and Treasurer, F. C. PRINDLE, of Wilmington, N. C.; General Superintendent, A. A. THOMAS, of Washington, D. C.; Directors, HON. WARNER MILLER, Hon. GEO. WEST, and JOHN C. CALHOUN, of New York; Hon. JOHN P. JONES, of Nevada; A. A. THOMAS, of Washington, D. C.; Hon. WM. MAHONE, of Virginia; Hon. D. L. RUSSELL, JOHN F. DIVINE, and F. C. PRINDLE, of Wilmington, N. C.

Railway Material, Supplies, etc., Wanted.—First-class white oak cross-ties, 10,000 to 20,000. Bennett H. Young, 23 Courier-Journal Building, Louisville Ky.

Cross-ties; 265,000; to be delivered between Sept. 1 and Jan. 1. O. H. P. Cornell, Chief Engineer, Cincinnati, Alabama & Atlantic Ry., Tullahoma, Tenn.

A 35 or 40-ton locomotive, 1 combination car, 5 flat cars; delivered at Chicago or Milwaukee by Sept. 1. Abbotsford & North Eastern Ry. Co., Milwaukee, Wis.

Locomotive and cars. A. THOMPSON, Vice-President Kansas City, Watkins & Gulf Ry. Co., Lake Charles, La.

Second-hand rails 8 to 12 lbs. per yd, 8 or 10 tons; also 10 pairs tram car wheels with axles and boxes. "H." office of *New Post*, Houston, Tex.

Two standard-gauge locomotives, 2 passenger cars, 2 freight cars, 7 miles of 32 to 35-lb. steel rails. Pine Bluff & Sulphur Springs Ry. & Land Co., Pine Bluff, Ark.

Two standard-gauge dummy engines for sale; made by H. K. Porter & Co. Metropolitan Street Ry. Co., box 288, Atlanta, Ga.

Gas engine of 4 H. P. wanted; 2 H. P. Otto gas engine for sale. L. Kiper & Sons, Atchison, Kan.

Tubular boiler, second hand, 50 to 65 H. P.; also 40 or 50 H. P. engine. J. M. HARLOW, Buckfield, Me.

A second-hand rock breaker, about 7 ins. by 9 ins. Paymaster Mining Co., Yuma, Ariz.

Artesian Wells.—Boring 9 or 10-in. well, 1,000 to 2,000 ft. deep. S. M. ROBERTSON, Secretary, Eagle Pass Fuel, Light & Water Co., Eagle Pass, Tex.

Boring an 8-in. well; steam and water furnished. E. S. BRIDGES, Navasota, Tex.

Tripp Journal Bearings. — A successful dynamometer test of the Tripp anti-friction journal bearing was made recently in the yard of the New York & New England Ry., at Boston, by J. B. HENNEY, Superintendent of Motive Power, and other officers of the road, and in the presence of representatives of the Thomson-Houston Co. and others. The test on cars numbered 150 and 156 of the M. C. B. standard journals showed a draughting strain of 600 and 800 lbs. respectively, and on the 12-wheeled Pullman car "Calypso" a strain of 700 lbs., averaging for the three cars 700 lbs. Car 158, with Tripp bearings, commenced running Jan. 28, 1889, and was guaranteed to run 1 year without any attention or additional lubrication, and has now run over 18,000 miles. This car was moved with a strain of 250 lbs., showing a saving of power of over 60 per cent, in favor of the Tripp bearings. The Tripp Mfg. Co., 33 India wharf, Boston, Mass., is about closing important contracts with several roads.

Hoisting Engines.—Several portable hoisting engines are wanted at once by Hill & McGovern, care of Jos. Schmitt, N. E. corner of 14th St. and 4th Ave.

Switches.—The Cam-Lock Switch Co. proposes to manufacture its switches at Chattanooga, Tenn. Mr. Hancock is general manager.—The Hart-Wood Switch Co. will establish works at Birmingham, Ala.

Naval Contracts.—The contract for the construction of the new coast defense vessel has been awarded to the Union Iron Works, of San Francisco, Cal., for $700,000. The contract for 428 tons of steel plates for the *Maine* has been awarded to the Linden Steel Co., of Pittsburg, Pa., for $34,753.60.

Shells.—The only bid received at Washington, on Aug. 1, for furnishing 100 7-in. and 100 11-in. steel shells was from the Standard Steel & Casting Co., of Thurlow, Pa., as follows: 7-in. shells $66.85 each, 11-in. shells $135 each. No award was made.

BRIDGES AND CANALS.

Kankakee River Improvement.—The Indiana Legislature, at its last session, appropriated $40,000 for the improvement of the Kankakee river. At Momence, Ill. (about 6 miles from the Indiana line) is a ledge of rock in the river which prevents the drainage of a large tract of swamp land in Indiana. Surveys have been made by Mr. W. M. WHITTEN, C. E., South Bend, Ind., and estimates for excavation beginning a short distance below the Chicago & Eastern Illinois R. R. track, where it crosses the river, and extending 8,000 ft. up the river. The channel is to be made 5 ft. deeper than at present, 100 ft. wide for drainage and 200 ft. wide for floods, requiring the excavation of 113,000 cu. yds. of stone. The area which will be benefited by this improvement is 400,000 acres of rich land, principally in Newton and Lake Counties, Ind.

Bridge Notes.—***South Thomaston, Me.***—A bridge is to be built to Spruce Head island by the County Commissioners. A charter was obtained in 1889, but the matter met with strong opposition. The bridge will be about 400 ft. long and will cost about $5,000.

Fall River, Mass.—The contract for a highway deck bridge at Rock St. has been awarded to the Berlin Iron Bridge Co., of East Berlin, Conn., at $9,887.

Wilson, N. Y.—The town board has awarded the contract for the Daniels road bridge to the King Iron Bridge & Mfg. Co., of Cleveland, O., at $525.

Union County, N. J.—County Engineer OWEN estimates the total loss in bridges and culverts damaged by the late floods, at $10,000 or $12,000.

Baltimore County, Md.—The County Commissioners are making arrangements for repairing or rebuilding the bridges damaged by the storm.

Memphis, Tenn.—The second caisson of the Mississippi river bridge was successfully placed in position from the Tennessee shore, on July 29. The caisson weighs 1,000 tons and is 47x92 ft. A force of 200 men is kept at work on the bridge day and night. The masonry for the piers will be completed by March.

Louisville, Ky.—The contract for the Louisville and Jeffersonville bridge, across the Ohio, has been awarded to the Phœnix Bridge Co., of Phœnixville, Pa. The cost is estimated at $1,000,000.

Columbia, S. C.—The Columbia, Newberry & Laurens Ry. Co. has awarded the contract for the superstructure of the bridge over Broad river to the Edge Moor Bridge Co., of Wilmington, Del., at about $100,000.

Augusta, Ga.—The Richmond & Danville Ry. Co. is expected to build a new bridge across the Savannah river.

Jacksonville, Fla.—Work is progressing on the St. John's river bridge of the Jacksonville, Tampa & Key West Ry. Anderson & Barr have the contract for the substructure, and the Keystone Bridge Co. the contract for superstructure. The draw was built by McCain Bros., of Chicago, and M. S. Carter & Co., of St. Louis, Mo., are building the approaches.

Natchez, Miss.—The Natchez Bridge Co. will let contracts for a bridge over the Mississippi. For particulars address W. F. MARTIN.

Cincinnati, O.—The County Engineer has been directed to prepare plans and specifications for a bridge over Mud creek.

Lima, O.—An iron bridge across the river is being built by the Cincinnati, Hamilton & Dayton, and Lake Erie & Western railways jointly.

St. Paul, Minn.—The city will shortly advertise for bids for a combination Pratt truss, 165 ft. span, 16 ft. roadway, with 2 sidewalks 6 ft. wide. L. W. RUNDLETT is City Engineer.

Kansas City, Mo.—The Missouri Valley Bridge Co., of Leavenworth, has been awarded the contract for the construction of a 250-ft. span bridge over the Kansas river at a cost of $14,500.

Belleville, Ont.—The site for the Bay of Quinte bridge has been located by Mr. KEEFER, C. E., of Toronto.

St. George, Ont.—Five new 50-ft. spans have been put up for the railway bridge. They were built by the Hamilton Bridge Co.

The Vermont Valley Ry. Co. has closed a contract with the Boston Bridge Co. for a new iron bridge to replace the wooden structure near the mouth of West river. The span will be 200 ft., with an approach of 50 ft. at the north end, and will cost about $15,000.

The Columbus Southern Ry. Co., of Columbus, Ga., has awarded contracts forbridges over Bull and Usatoie creeks to the Phœnix Bridge Co.

Bridges in Minnesota.—The State Legislature at its last session authorized the issuing of bonds for bridge work as follows: Two Rivers, authorized to issue bonds for $2,500 for bridge across the Mississippi to Belle View. Dak; $2,000 for bridge across Sauk river. Melrose; $2,000 for bridge across Sauk river. St. Cloud; city bonds for bridge across the Mississippi. Elliendale; $2,500 towards bridge between Two Rivers and Belle View. Belle View; $7,500 for same bridge. Delano; $5,000 for wagon bridge across the south branch of Crow river.

Appropriations for bridges were made as follows: $500 to build a bridge across south branch of Crow river in McLeod county; $200 for bridge across Buffalo creek; $300, Olla Lake, McLeod county; $350 for town of Whitefield; $250 across Crow river in Kandiyohi county: $300 across Chippewa river in Swenoda township, Swift county; $300 in Judicial road district in Chippewa and Lac qui Parle counties; $400, between Lac qui Parle and Cerro Gordo; Town of Hinckley, $500; Sheffer and Sunrise, $500; Wykehano, $300; east and west road, Morrison county, $500; Sauk Center, $300; Rockville, $200; near Henderson, $500; bridge at Nora, Blue Mound, $200; Ortonville, $200; in Grant county, $250; Aurdale, $500; Breckenridge, $500; Kenyon, $250; Newport, $1,000; Princeton, $250; Kingston, $600; Minnesota Falls, $175; Briggs Falls, $166; Dryden, $1,000; Tyrone, $1,000; Cannon City, $500, Cannon Falls, $500; Mount Prairie, $500 Houston, $500; Rush creek, $1,000; Albert Lea, $600; Prescott, $500; Blue Earth river, $500; Okabena river, $500; Vermillion river, $1,000; Crow river, $500.

County appropriations were as follows: Grant Co., $250; Stevens Co., $250; Becker Co., $500; Sherburne Co., $167; Yellow Medicine Co., $158; Watonwan Co., $150; Redwood Co., $1,000; Blue Earth Co., $500.

New York State Canals.—Proposals for lengthening locks Nos. 23, 24, 25, and 26, Erie canal, will be opened Aug. 20, by JAMES SHANAHAN, Superintendent of Public Works, Albany, N. Y. The quantities are as follows: 4 bailing and draining; 10,000 cu. yds. excavation; 1,000 cu. yds. rock excavation; 520 cu. yds. excavation of old masonry; 7,500 cu. yds embankment; 1,725 cu. yds. lining; 1,430 cu. yds. puddling; 230 cu. yds. slope wall; 7 cu. yds. loose stone filling; 415 cu. yds. vertical wall in cement; 1,155 cu. yds. vertical wall laid dry; 4,900 cu. yds. masonry in lock walls; 720 cu. yds. concrete masonry; 61,000 ft. B. M. white oak timber and plank; 44,000 ft. B. M. white pine timber and plank; 336,000 ft. B M. hemlock timber and plank; 30,000 ft. B. M. white oak in gates and sills; 22,400 lin. ft. bearing piles delivered; 22,000 lin. ft. bearing piles driven; 2,640 lin. ft. fender piles delivered; 2,400 lin. ft. fender piles driven; 322 lin. ft. fender piles delivered and set; 340 lin. ft. snubbing posts set; 23,500 lbs. wrought iron; 1,500 lbs. cast iron; 14,000 lbs. spikes and nails; 4 sulphur and sand cement; 200 lbs. lead cement per lb.; 4 painting lock gates and railing; 16 composite valves and fixtures: 4 kerosene street lamps in place; 120 lin. ft. gas-pipe railing including sockets, T's, etc. Deduct materials furnished by State.—120 cu. yds. face stone at $8; 180 cu. yds. backing stone at $2.50; 40 cu. yds. vertical wall stone at $1.75; 175 cu. yds. slope wall stone at $1.25; 75 cu. yds. loose stone at $0.75.

Canal.—*Middlesborough, Ky.*—The Middlesborough Town Co. has let contract for cutting a canal to change the course of the Big Yellow creek, to the Allison & Shafer Construction Co., of Chattanooga, Tenn.

ELECTRICAL.

The Heisler Electric Light Co., of St. Louis, has been awarded the contract for furnishing 500 incandescent lights of 30 c. p. for the St. Louis exposition this fall. The company is furnishing a complete set of apparatus for this display in the universal electrical exhibition. This plant, in addition to supplying the exposition with lights, will illustrate the adaptability of the Heisler system for distributing incandescent lights from central stations over wide areas. The company reports the starting of central stations at San Marcos, Tex., and Marseilles, Ill.; the principal lighting done at the latter place is in Ottawa, 8¼ miles distant, one of the circuits being 34 miles in length.

Electric Lighting.—*Westerly, R. I.*—The Westerly Electric Gas Light Co. has put its additional Westinghouse plant in operation.

Lynn, Mass.—The Lighting Committee has agreed upon a new contract, by which it is proposed to substitute 800 incandescent lights for the 625 gas and oil lamps now in use; 17 new arc lamps will also be added. The incandescent lights will be furnished for $15 each annually and the arc lights for 40 cts. a day.

Gloversville, N. Y.—The Gloversville Electric Co. has been incorporated, with a capital of $60,000. The company will supply electric light to the villages of Johnstown and Gloversville.

Allegheny, Pa.—Proposals for electric lighting are being advertised for: there are to be 450 arc lights of 2,000 c. p. The entire plant must be completed and in operation 4 months after the award of the contract. The city is to have the privilege of purchasing any time within 5 years, the plans to be operated on a rental basis, until the city shall choose to purchase.

Washington, D. C.—The District Commissioners will receive proposals until Nov. 1 for lighting for 1 or 5 years.

Stanford, Ky.—It is proposed to establish an electric light system in connection with the new waterworks.

Covington, Ky.—The Citizens' Electric Light & Power Co. has secured a location for its power station.

Middlesborough, Ky.—The Orient Electric, Water & Gas Co. has a contract with the Middlesborough Town Co. to put in electric lights.

Sumter, S. C.—The Sumter Electric Light Co. has been organized. President, A. J. CHINA; Manager and Secretary, D. J. AULD: Electrician, C. T. MASON, Jr.

Mobile, Ala.—The Alabama Gas & Electric Light Power Co. will erect a gas and electric light plant at a cost of $100,000.

Ironton, O.—The city has contracted with the Fort Wayne Jenney Electric Light Co. for an incandescent system of street lighting, to cost $34,385.15. It will be in operation in about 3 months.

Bellaire, O.—A contract for street lighting has been let to the local company.

Mt. Vernon, O.—The water-works trustees have decided to light Riverside park with electricity.

Jacksonville, Ill.—This city has seven electric light towers, which are used for lighting different portions of the city. There is one 125 ft. high in Central Park on the square. Owing to the extreme height of these towers and the small illumination they give, the Council is talking of taking the towers down and substituting lights hanging lower down, as, owing to the number of trees in the city, the towers afford but little light on the ground.

Kankakee, Ill.—The contract for electric lighting has been awarded to the Kankakee Electric Co. The company will furnish 40 2,000-c. p. lights for $2,850 per year, or $71.25 per light per year, payable monthly, to run by Philadelphia schedule, the city having the privilege of ordering the lights on any night, and running as long as wanted by paying 40 cts. per light per hour. Any number of lamps over 40 may be ordered at the same rate. In addition, the company will furnish sufficient incandescent lights to light city hall and hose house, and place one 32-c. p. lamp in front of the building. The Ball Electric Co., of Pekin, Ill., bid $7,085 for 80 lights of 1,000 c. p.; or 80 lights of 1,000 c. p. at $9,144. The Western Electric Co. bid $10,394 for a plant of 40 lights of 2,000 c. p., or $75 per light per year for operating the plant. The Cumberland Construction Co., of Plattsburg, N. Y., bid $7,935 for 50 lights of 1,200 c. p. The Westinghouse Co. bid $9,321, and the National Electric Co., of Eau Claire, Wis., $10,900.

Louisiana, Mo.—A franchise has been granted to the Louisiana Gas Co. for electric lighting.

Fairbury, Neb.—The city contemplates putting in a plant of its own.

Charlton, Ia.—A plant of 1,000 incandescent lamps is to be put in.

Red Oak, Ia.—An electric light system is projected.

SEWERAGE AND MUNICIPAL.

Bonds.—At Buffalo, N. Y., the $100,000 of 7 per cent. water bonds for the Dodge farm reservoir have been sold to Coffin & Stanton, of New York, for $50,171 premium. The $150,000 of 3½ per cent. refunding bonds have been sold to F. Kloeckner, of New York, at $13,500 premium.

Pontiac, Mich.—The plans and maps for a complete system of sewers have been completed by W. S. PARKER, C. E., submitted to the committee and approved. The city will probably issue bonds for the construction of the main outfall, and main intercepting sewers, and advertise for bids at once. The system complete will comprise about 30 miles of pipe, including mains and laterals, but there are several laterals that will not be required for some years.

Street Work.—*Troy, N. Y.*—A large amount of street work is contemplated.

Macon, Ga.—It is proposed to issue $2,000 in bonds for street work and sewers.

Mobile, Ala.—Some of the streets are being paved with brick of domestic manufacture.

St. Louis Mo.—A number of street improvement contracts have been let to Allen & Vieths, G. Eyermann, H. Ruecking & Co., Stifel & Ruckert, and C. Peiper.

Houston, Tex.—Mr. M. Butler has a contract for wood paving of bois-d'arc blocks.

Sewers.—*Hillsborough Bridge, N. H.*—An act has been passed authorizing the construction of a system of sewers.

Claremont, N. H.—An act has been passed authorizing the village to construct a system of sewers.

Chicopee, Mass.—Pipe for the new sewers will soon be ordered.

Gloucester, Mass.—Mr. BOWDITCH, C. E., has made a proposition to make the surveys for the sewer system for $1,625. The construction will cost about $375,000. The city will apply to the Legislature for authority to construct the proposed system.

Northampton, Mass.—The sewer commissioners have awarded the contracts to the Metropolitan Construction Co., of Boston, for the west side, and to F. A. Shaw, of Providence, R. I., for the east side.

White Plains, N. Y.—The contract for the new sewers has been let to John C. Merritt & Co., of Port Chester, N. Y., at $159,690.

Mt. Vernon, N. Y.—The proposition to issue $60,000 of sewer bonds has been defeated by a vote of 197 to 103.

New Brighton, N. Y.—A system of sewers is projected by the trustees of this Staten Island village.

Newark, N. J.—Several breaks have occurred in the flume which conveys the sewage across the meadows from the city to the bay. It is 10,400 ft. long, in 2 parts each about 4 ft. square; its cost was $700,000.

Gloucester City, N.J.—A contract for pipe-laying has been let to W. H. Shearman, of Camden, at $15,808.65.

Pittsburg, Pa.—A 12-in. pipe sewer is to be built in Lynn St.

Washington, D. C.—The President will appoint a commission of engineers to investigate and report on the sewerage system of the District, with a view to its improvement. The appropriation for expenses is $75,000.

Circleville, O.—A storm sewer is to be built on Pickaway St., at a cost of $15,000.

Winona, Minn.—Engineer FELLOWS is preparing plans and profiles for the sewer system.

Kansas City, Mo.—Bonds for $500,000 are to be issued to build a sewer along the course of O. K. creek, and to build a city hall.

Lincoln, Neb.—It is proposed to issue bonds for $20,000 for sewer extensions.

Portland, Ore.—A 36 and 45-in. brick sewer is to be built; also a terra-cotta pipe sewer. Supt. CHAPMAN has prepared the plans for the work.

Oakland, Cal.—It is proposed to expend $829,063 on a sewerage system sufficient for a population of 250,000.

Salt Lake City, Utah.—The city will purchase 1,000 ft. of iron pipe to carry the sewage across the Jordan.

Chicago, Ill.—The Committee on Health and County Relations has recommended the acceptance of the plans proposed by Mr. GORDON H. MOTT for lower level sewerage. The system includes a tunnel 20 ft. diameter, 26 miles long; shallow settling basins, where precipitants can be used; and a system of about 35 miles of sewers 15 or 20 ft. lower than the level of the existing sewers. The total estimated cost is $12,348,600.

Brooklyn, N. Y.—Chief Engineer VAN BUREN, of the Department of City Works, is preparing the specifications upon which contractors are to be asked to bid in connection with the water extension. He is also going over the plans for the 26th Ward sewer system and for the Greene Ave. intercepting sewer. These works will cost in the aggregate about $6,000,000. The second work mentioned includes the deodorization of the sewerage and pumping it into the bay, the sludge being made into fertilizing material.

Flush Tanks.—The Sewer Commissioners of Green Island, N. Y., have awarded the contract for flush tanks to Hawley & Wallace, of Schenectady, at $35 each. The machines have been in service on trial for two months, and have been found very satisfactory.

WATER-WORKS.

NEW ENGLAND.

Fort Fairfield, Me.—The new works will be completed about Sept. 1.

Danforth, Me.—A new dam is to be built. Address Weatherbee, Bubar & Co.

Bucksport, Me.—Steps to establish works will be taken at once. The contract has been awarded to JAMES MITCHELL.

Manchester, N. H.—The supply is contaminated by mill-owners emptying sawdust into Lake Massabesic. Steps will be taken to prevent this and to purify the city's supply.

Boscawen and Penacook, N. H.—An act has passed the Legislature incorporating the Boscawen and Penacook Water-Works Co.

Hampton, N. H.—An act incorporating the Hampton Water-Works Co. has passed the Legislature.

Lancaster, N. H.—A bill incorporating the Lancaster Water & Electric Light Co. has passed the Senate.

Canaan, N. H.—An act incorporating the Canaan Water-Works Co. has been passed by the Legislature.

Wolfborough, N. H.—Works are to be established this season. Address the Town Clerk.

West Canaan, N. H.—A small gravity system of works, for domestic supply only, has been established by the West Canaan Aqueduct Co. Water is taken from springs.

Bristol, Vt.—The Munsill works now cover nearly the whole of the northern part of the town.

Methuen, Mass.—A storage reservoir is to be constructed.

Springfield, Mass.—FREDERICK P. STEARNS, Engineer of the State Board of Health, has analyzed Ludlow water, and found it contains more impurities than it did one year ago. The Jewell and the Oliphant filtering companies have made propositions to purify the water, by their respective systems.

Gloucester, Mass.—The city has voted to contract with the company for 30 additional hydrants, 25 to be placed in Magnolia and 5 in Western Ave.

Pittsfield, Mass.—A dam 80 ft. long and 5 ft. high is to be built. The recent storm has made this and other improvements necessary.

Andover, Mass.—Bids for laying 20 miles of cast-iron pipe will be received on Aug. 14. FELIX G HAYNES has sent us the following:

Contracts for complete works will be let in September. The town will be bonded for $150,000. Water will be pumped from Haggett's pond to a reservoir, and used for fire protection and domestic supply. Engineer, PERCY M. BLAKE. Water Commissioners, JOHN H. FLINT, J. P. BUTTERFIELD and FELIX G. HAYNES.

Pawtucket, R. I.—An appropriation of $10,000, for general construction, has been made.

Woonsocket, R. I.—BYRON I. COOK informs us that a new tank, 50 ft. in diameter by 35 ft. high, and 2 miles of mains will be added this season.

Warehouse Point, Conn.—Pipe-laying is progressing rapidly. Goodhue & Birnie, Springfield, Mass., are the contractors.

Litchfield, Conn.—Works are projected. Address the Town Clerk.

Waterbury, Conn.—Improvements, including a new reservoir, will be made.

MIDDLE.

Amityville, N. Y.—Works are projected.

Liberty, N. Y.—A water company was organized to build works on Aug. 1. Capital stock, $20,000. G. N. COWAN, Stamford, N. Y., and others are the organizers.

Hancock, N. Y.—The Hancock Water Co. will complete a gravity system of works about Oct. 15. Estimated cost, $16,000. The officers are: President, THOMAS KERRY; Secretary, Treasurer, and Engineer, GEORGE N. COWAN, Stamford, N. Y.; Superintendent, S. N. WHEELER.

Albany, N. Y.—Proposals will be received until Sept. 3 for excavating for engine house and engine foundations, and building engine foundations and building the engine houses, boiler houses and chimneys, for the pumping station between the Erie canal and the Watervliet turnpike. Address H. E. SICKLES, Secretary Special Water Commission. ["Proposals Open" was given in our last issue.—ED.]

Portage, N. Y.—W. J. AGNE and A. E. LITZ, of Buffalo, N. Y., are making surveys for Rochester parties, for a storage dam across the Genesee river near this place.

Camden, N. J.—The question of securing a new source for the city's water supply is being discussed. It is said the extension of the Fisher Point dyke to Petty's island, which will probably be made soon, will cut off the entire present supply.

Hoboken, N. J.—The reservoir of the Hackensack Water Co., at Weehawken, has been undermined and considerably damaged by the recent heavy rains. It will be repaired at once.

Newark, N. J.—The East Jersey Water Co. has been incorporated and the following officers elected, all are representatives of the Lehigh Valley R. R. Co.: E. V. WILBUR, President; CHARLES HARTSHORNE, Vice-President, of Philadelphia; DAVID G. BAIRD, Secretary, of Beverly, Mass. The charter runs for fifty years. Capital stock, $3,000,000. The City Council has approved the contract framed by the Aqueduct Board with this company, and steps to secure a water supply will be taken at once.

Under the terms of the contract, the city is to acquire on or before May 1, 1892, a supply of pure water of 27,500,000 galls. per day, delivered by gravity, at a total cost of $4,000,000. At the end of 11 years, on the payment of $2,000,000 additional, a daily supply of 50,000,000 galls. is to be delivered and assured to the city; and, in any case, the sums here named are to be accepted in full satisfaction of the obligation incurred by the city in this contract. When the new works are constructed to the satisfaction of the city government, and in fulfilment of the terms of the contract—which are minutely specified—the entire plant, reservoirs, pipe-lines, etc., is to be turned over to the city to be operated by it. The daily average supply of water delivered to the city by the present system is about 14,000,000-galls. The average income of the Aqueduct Board is $340,000. In 1892, it will be $410,150, allowing for the natural increase of demand; $300,000 would then pay the interest on $7,500,000 of water-debt, $4,000,000 of the new debt and $3,500,000 of the old. This would leave $110,150 to cover operating expenses.

Woodstown, N. J.—Address the Town Clerk for information regarding the proposed works.

Plainfield, N. J.—The following bids for works were opened on Aug. 5: Wheeler & Parks, Boston, Mass., 210 hydrants for $6,000; Malcolm Peters, for Chas. Nash, Philadelphia, $40 per hydrant for 200 hydrants, or will build the works for the city for $280,000; John Lockwood, $30 per hydrant; J. M. Lowe, Kingston, N. Y., $30 per hydrant; M. H. Clarke, $7,500 for 200 hydrants; Chas. K. Moore and H. A. Lovell, 21 Liberty St., N. Y., $15 per hydrant; E. Woltman and E. F. Fuller, $25 per hydrant; F. Hopkinson Smith, $27.50 per hydrant. The decision of the Council was postponed to Sept. 16.

Allegheny City, Pa.—Plan No. 1 to extend the supply pipe to the head of Nine Mile island, has been affirmatively recommended to the City Council. The estimated cost of the work is $1,500,000.

Elm Station, Pa.—An artesian well is to furnish the supply for a small system of works for domestic use. A 25,000-gall. tank will be required. Address, C. W. McFARLAN, American Building, Philadelphia.

McKeesport, Pa.—A high-pressure pump is to be added at once.

Bridgeport, Pa.—Works will be completed Oct. 1. Supplies have been purchased. Young Bros., of Philadelphia, are the contractors.

Cheltenham and Contigous, Pa.—The construction of works is contemplated. Engineers, YOUNG & MIDDLETON, Philadelphia.

Curwensville, Pa.—Works are projected. Engineers, YOUNG BROS., Philadelphia, Pa.

Parksburgh, Pa.—Works are projected. Address the City Clerk.

Kutztown and Hamburg, Pa.—Address F. H. CHEYNEY, Philadelphia, Pa., for information regarding the proposed works.

Elizabethville, Pa.—The town is to have a public water supply. JAMES MILLER is President of the company.

Millersburg, Pa.—Artesian wells are projected as a source of supply for the proposed works.

Reading, Pa.—CYRUS T. FOX, Secretary Water Department, informs us that $150,000 will be expended this season in increasing the supply.

The improvements will include new pumping machinery with a capacity of 5,000,000 to 8,000,000 galls. and a new pumping station.

Homestead, Pa.—Nobody has as yet secured the right-of-way for building works.

Cambridge, Md.—Several propositions have been made to build works. Address W. L. HENRY.

SOUTH ATLANTIC AND SOUTH CENTRAL.

Hampton, Va.—C. T. HOLTZCLAW, President, informs us they will erect a 400,000-gall. stand-pipe at once. The supply is to be taken from gang wells.

Gordonsville, Va.—Sealed proposals will be received on Aug. 16, for furnishing materials, constructing reservoirs and laying all pipes for a complete system of works. B. E. STRATTON is Chairman of the Water Committee.

Morgantown, W. Va.—A gravity system of works is being constructed by the Union Improvement Co.

Wheeling, W. Va.—The new reservoir is nearly completed.

Statesville, N. C.—Estimates for building works are wanted by N. J. EVANS, Chairman Committee on Water-Works. Contracts will probably be let within 30 days.

Cartersville, Ga.—The Cartersville Water-Works Co. has been organized. The officers are: President, J. S. BAXTER; Secretary, DOUGLAS WIKLE; Treasurer, A. E. BOARDMAN. Directors: J. H. VIVION, JNO. A. STOVER, A. E. BOARDMAN, J. S. BAXTER and R. L. HENRY.

Lexington, Ga.—Works are being discussed. Address W. A. SHACKELFORD.

Macon, Ga.—The company will build a new reservoir and make other improvements. A. E. BOARDMAN is Superintendent.

Sheffield, Ala.—The Sheffield Water Co. has been organized with a capital stock of $250,000; $100,000 of bonds have been sold. A stand-pipe, 20 ft. in diameter by 30 ft. high, will be erected and 20 miles of additional mains laid.—[The above company is probably controlled by the Sheffield Land, Iron & Coal Co. J. V. ALLEN, Treasurer.—ED.]

Chattanooga, Tenn.—Additional mains are being laid. Work on the St. Elmo reservoir will be begun soon. The Mission Ridge reservoir has been completed.

Sherman Heights, Tenn.—J. T. WILDER, Roan Mountain, Tenn., contemplates building works. The estimated cost is $25,000.

South Pittsburg, Tenn.—The new works have been satisfactorily tested.

Cleveland, Tenn.—J. E. SINGUM informs us that works will probably be built. Address JOHN H. CRAIGIVELS or JOHN H. PARKER.

Memphis, Tenn.—The Cook Well Co., St. Louis, Mo., has sunk 20 wells. A daily supply of 30,000,000-galls. is thus obtained.

Murfreesboro, Tenn.—H. B. COLLINS, Superintendent, informs us that the Board of Aldermen contemplate extending the mains and adding 6 to 10 hydrants. Also putting in duplicate pumping machinery next season.

Bowling Green, Ky.—The city will probably extend its mains. Address J. F. DUNCAVAN.

Mayfield, Ky.—Reports now state that the Commonwealth Construction Co., of Philadelphia, will build the works and that bids for material are wanted. A stand-pipe, 14 ft. in diameter by 125 ft. high, will be required.

Covington, Ky.—The Reservoir Trustees refusing to advance 15 per cent. of the contract price, Crane & Co., of Cincinnati, have abandoned their contract. One of the reservoirs is nearly completed. It is estimated that $525,000 more than the original estimate have already been expended. The Trustees have filed suit against the contractors in the Chancery Court, restraining them from removing any part of their plant.

NORTH CENTRAL.

Cincinnati, O.—Larger and additional mains will be laid soon.

Longview, O.—Bids will be received on Aug. 17 for constructing a boiler room and pump house at the Longview Insane Asylum. Address FRED. RAINE, County Auditor, Cincinnati.

Washington C. H., O.—In the account of these works given in our last issue, we should have stated that the 125 hydrants and 55 valves were furnished by the Bourbon Copper & Brass Works, Cincinnati, O.

Wilmington, O.—The special election held on Aug. 5, to ratify the contract with JOHN P. MARTIN, of Xenia, O., rejected his proposals by a majority vote of 218.

Columbus, O.—The question of appropriating $150,000 for needed extensions and improvements is being discussed.

Franklin, Ind.—Work has been begun. J. A. O'NEIL, of Indianapolis, is the contractor. The supply will be from 8 wells sunk 72 ft. apart, to second water.

Crawfordsville, Ind.—The city pays $41.66 for each of its 130 hydrants.

Waterloo, Ind.—Works are projected. Address the Town Clerk.

Greenfield, Ind.—E. W. FELT, Clerk Water-Works Trustees, has sent us the following:

Contracts for works will be awarded on Aug. 19. The supply will be taken from a well 30 ft. in diameter. Estimated cost, $25,000; to be raised by city bonds. I. A. CURRY, Chairman.

Seymour, Ind.—The Seymour Water Co. has been incorporated. Capital stock, $80,000. The Directors are: W. E. MCMILLAN, J. A. LAMON, LOUIS SCHNECK, B. F. PRICE, M. MOORE, C. W. MOORE and C. O. CHESTNUT.

Albion, Mich.—Bids for constructing complete works will be received Aug. 15. Address R. J. FROST, Chairman Board of Water Commissioners.

Mecosta, Mich.—A good supply of water has been obtained from a well 160 ft. deep.

Marshall, Mich.—Works are to be built. The supply will be taken from the well mentioned in our last issue.

Collinsville, Ill.—Bids will be received on Aug. 23, for building and operating works to include the following: One reservoir, 4½ miles of mains, stand-pipe, pumping station, and 45 hydrants. Specifications can be obtained from JAMES N. PEEBS, County Clerk. Consulting Engineer, J. B. JOHNSON, St. Louis, Mo.

Havana, Ill.—The Holyoke Steam Pump Co., of Holyoke, Mass., has been awarded the contract to furnish a 1,000,000-gall. pumping engine.

Avondale, Ill.—We are indebted to F. E. THORNTON, for the following:

Contracts will soon be let for works to be completed in 12 months. The supply will be taken from Lake Michigan, via Chicago, and pumped to a stand-pipe. Address the Commissioner of Water-Works, of Chicago, Ill.

Peoria, Ill.—An experimental well, 8 ft. in diameter, is being sunk.

Pinckneyville, Ill.—The City Council has employed YOUNGBLOOD & BARR, of Carbondale, to draw up the water-works ordinance.

Chicago, Ill.—The water is contaminated by dumping filth too near to the shore. Prof. LANG has recently analyzed it and states: "The water is bad" and "shows marked pollution."

Lake Forest, Ill.—Works will be built. The Spring Forest Water Co. has been incorporated to supply this and other towns with water. Capital stock $30,000. The incorporators are JOSEPH T. BOWEN, HENRY IVES COBB, and HENRY N. TUTTLE.

Pekin, Ill.—The company will probably replace a considerable quantity of 4-in. pipe with 6-in.

Green Bay, Wis.—W. K. HARRINGTON, Superintendent, Green Bay & Fort Howard Water-Works Co., informs us, that the second artesian well is completed. It is 911 ft. deep, 6 in. in diameter and flows 300 galls. per minute. Also that 2,000 ft. of 6-in. mains have just been laid.

Depere, Wis.—An eastern syndicate has purchased the works at $100,000. The capital stock of the new company is $300,000. The officers are: President, JOHN W. DYER, Portland, Me.; Secretary, HIRAM KNOWLTON Portland, Me.; Treasurer JOHN HICKEY, Kaukauna, Wis.

NORTHWESTERN.

Fayette, Ia.—An artesian well is projected.

Creston, Ia.—Works are to be built. The supply will be taken from artesian wells. Address the Town Clerk.

North Des Moines, Ia.—JOHN MAC VICAR, Mayor, informs us that plans will be made and bids wanted soon. The result of the recent vote was 215 for and 20 against the town establishing its own works.

Fort Madison, Ia.—The Fort Madison Electric Light Co., the Fort Madison Water Co., and the Fort Madison

Gas-Light Co. have been consolidated. The combined capital is $900,000. The New York Contract Co. is the purchaser. The consolidation of the two light companies and the water company is to make no difference to the city in the public lighting or water using, and the rates for private consumption will probably not be increased. It is expected that many improvements and extensions will be made.

Minneapolis, Minn.—City Engineer RINKER has submitted a list of water mains needed next year, which includes a 24 or 36 in. main from the Shingle creek pump house down Lyndale avenue, and 17 other lines. An estimate of $5,750, balance of 75 per cent. due on the new Worthington pumps of North Minneapolis, has been allowed.

Omaha, Neb.—The new plant of the American Water-Works Co. has been put into operation. The pumping station is located at Florence.

Alexandria, Dak.—An artesian well will be sunk.

Helena, Mont.—Bids for furnishing a water supply were received on August 1 from GEO. F. WOOLSTON, of Boston, Mass., and T. C. POWER and JOSEPH DAVIS; both of Helena. Reports state that GEO. F. WOOLSTON has purchased the rights, privileges, and franchises of all the other companies for $341,000, and organized the Helena Consolidated Water Co.

SOUTHWESTERN.

Kansas City, Mo.—By a recent test of the water-works, it was found that the pressure in the highest parts of the city was less than that called for by the contract with the company. The old contract does not expire until 1893, but it is thought a new one will be made with the company before that time.

Eureka Springs, Ark.—Works will be built. The city prefers contracting with a company. Address J. T. SPRING.

Arkansas City, Ark.—Works are being built by the Arkansas City Water-Works Co. A tank, engine, and other supplies are wanted. The mains have been laid and hydrants set.

Bonham, Tex.—The city proposes to build works. Address the Mayor.

Houston, Tex.—Another well is to be sunk at once. A daily supply of 400,000 galls. has been obtained from the last well, which makes the total daily supply 2,500,000 galls.; it will be increased to 3,000,000 galls.

Meridian, Tex.—HENRY KING has made application for a franchise to build works. Address R. G. CHILDRESS, Mayor.

Eagle Pass, Tex.—Bids are wanted for boring a 9 or 10 in. artesian well 1,000 or 2,000 ft. deep. Address, S. M. ROBERTSON, Secretary Fuel, Light & Water Co.

Navasota, Tex.—Proposals are wanted for sinking an 8-in. artesian well. Address, E. S. BRIDGES.

Canon City, Col.—The water supply is reported to be inadequate for fire protection.

Salida, Col.—A new reservoir will probably be constructed and 2,800 ft. of wrought-iron pipe laid this season. Address J. W. DEEN.

Seattle, Wash.—The city will probably buy the works from the West Coast Improvement Co., provided they can be had at a reasonable price, and greatly extend and improve them. Parts of the city are without any fire protection whatever.

North Seattle, Wash.—An ordinance has been passed granting C. D. STINSON, D. B. WARD, WILLARD STINSON, H. H. AMES, A. ROBINSON, C. B. HOLENOMARD, and C. B. BAGLEY, the right to lay pipes and furnish a private water supply. The well which is to furnish the supply has been dug; a tank constructed and all the materials are on the ground for completing the system.

McMinnville, Ore.—Bids for building works, at a cost not to exceed $20,000, will be received on Aug. 20. The supply will be taken from Yamhill river. The specified daily supply is 500,000 galls. CHARLES GRISSÉN is Chairman of the Water Committee.

Portland, Ore.—The Englewood Crystal Spring Water Co., is now furnishing pure spring water. W. M. Wisdon & Co., are mentioned as being connected with the works.

Oregon City, Ore.—A 10-in. main is being laid through the principal streets for fire protection. Is will be connected with a water-power pump. Address Charman Bros.

Albina, Ore.—An additional force pump is to be added.

Los Angeles, Cal.—JOSEPH MESMER, Chairman of the East Side Board of Trade has presented the following report which was accepted, on the water supply question:

To take water from the river by means of a submerged dam at a point about 4 miles north of the city limits, and conduct it in cement pipes to a reservoir site of 110 acres in the Ivanhoe tract, purchased by the city from M. L. WICKS about 2 years ago. The elevation of this reservoir is about 440 ft. above sea level, and it can be made to hold over 300,000,000 galls. A pipe line to be laid to reservoir No. 4, a distance of 2 miles. This reservoir has an elevation of 427 ft., and will hold over 250,000,000 galls. It is also proposed to excavate a reservoir on the top of a hill, from which a sufficient pressure for fire protection and sewer flushing would be obtained. An electric plant could be run by the force of the water, and other mechanical appliances could obtain power in the same way. The annual benefits from such a system would be, besides the interest on the expenditure, $75,000 to the property owners in reduced water rates; $50,000 in the electric light plant, with a profit of $55,000 through the sale of electricity; $25,000 in the cost of the fire department; $20,000 in lower rates of insurance, and $15,000 in street sprinkling.

Tucson, Ariz.—A bill has passed the Legislature authorizing the city to expend $3,000 in sinking an artesian well. A petition is to be sent to the Board of Supervisors asking them to take action at once.

Ogden, Utah.—A small system of works to supply the Union depot have been completed.

Salt Lake City, Utah.—About 50 additional wells will be sunk. An estimated daily supply of 6,000,000 galls. is obtained from the 36 wells already sunk.

CANADA.

Truro, N. S.—Correcting what seems to have been an error in one of our previous statements, E. H. KEATING, City Engineer of Halifax, sends us the following:

St. Louis, Mo.—The following proposals for building Section G of the low service conduit, have been received by HENRY FLAD, President of the Water Department:

	Quantities	Bidders							
		Fruin-Bambrick Construction Co.		Allen & Vieths		Aug. Heman and John B. O'Meara		H.S. Hopkins & Co.	
		Price	Amount	Price	Amount	Price	Amount	Price	Amount
Earth excavation	44,000 cu. yds.	.20	$8,800	.35	$15,400	.25	$11,000	.32	$14,080
Soil dressing	1,600 "	.20	320	.25	400	.25	400	.50	800
Concrete	13,300 "	5.80	7,714	6.40	85,120	6.00	79,800	6.25	83,125
Granitoid	68,700 sq. ft.	.20	13,740	.22	15,114	.18	12,366	.20	13,740
Brick masonry	8,200 cu. yds.	8.30	68,060	9.00	73,800	8.50	69,700	8.60	70,520
Stone "	120 "	20.00	2,400	25.00	3,000	30.00	3,600	12.00	1,440
Slope paving	500 sq. ft.	.20	100	.07	35	.02	10	1.00	500
12-in. iron pipe culvert	200 lin. ft.	2.20	440	2.00	400	2.00	400	3.00	600
20-in. "	120 "	4.90	588	5.00	600	4.50	540	5.00	600
36-in. "	350 "	10.30	3,570	12.00	4,200	12.00	4,200	10.00	3,500
	Totals	.....	$175,158	.....	$198,069	.....	$182,016	.....	$188,905

Montrose, Col.—F. H. REINHOLD, Superintendent, informs us that they contemplate adding a new boiler.

PACIFIC.

Cheney, Wash.—The City Council has granted a franchise to W. R. ANDRUSS and associates, to put in a reservoir system of works. The water will be obtained from Fish lake. The company figure the cost of the work at $40,000. They contract to furnish 300,000 galls. per day. It costs the city $150 per month for 15 years, including the water needed for fire protection and street sprinkling purposes.

Schome, Wash.—H. HOFERCOMP sends us the following:

The Bellingham Bay Water Co. is now building works. Their principal office is at Schome. Secretary, EDWARD FISHER.

Chehalis, Wash.—The Chehalis Flume & Aqueduct Co. will build a flume from Newaukum river to Chehalis, a distance of 8 miles, which is to furnish water power for mills and operate the pumps for the water-works they are to build.

The original works were designed on much too small a scale. The plans for enlargement and alteration prepared by me were adopted and the work is being gradually carried out from time to time as necessity arises, but not all at once, and the new dam and gate-house have not been commenced. The works when completed will be entirely changed from pumping to gravity works. At present both systems are in operation.

Campbellford, Ont.—Bids for building works will be received on Aug. 15. Address JOHN GALT, Consulting Engineer, 53 King St., Toronto.

London, Ont.—The water supply is inadequate. The Commissioners have notified South London to make other arrangements for their supply.

Chatham, Ont.—The city proposes to build works. The supply will probably be taken from driven wells. Address N. H. STEVENS, President of the Board of Trade.

New Westminster, B. C.—E. A. WILMOT and A. E. HILL have been appointed to prepare plans and specifications for the new works.

FOREIGN.

Queensland.—A scheme to supply Brisbane with water has been submitted by Mr. DAVIDSON. The estimated cost of the works is $1,078,685 The supply would be taken from the Upper Brisbane river and pumped to a high-service reservoir, 445 ft. above the level of the sea.

Guatemala.—In June last the municipal authorities of the city of Guatemala advertised for full general and detail plans for a proposed water supply for the city, 30 days being given in which to prepare them. Probably 30 miles of line would have to be run to determine the best means of bringing in the water and distributing it throughout the city. The scheme is to reconstruct the old aqueducts and build some new ones from other sources of supply. To that end the city authorities have granted permission to issue $1,500,000 in bonds (silver), to do the work, and the first issue of $500,000 has already been subscribed. The bonds are secured by liens on city property. The system at present comprises two aqueducts built nearly a hundred years ago, one from the Rio Pinula and the other from Mixco, these aqueducts are now in very bad condition, a great deal of the water escaping. As these aqueducts discharge directly into the city mains, frequently during the rainy season the water is very thick. The distribution in the city is made entirely by earthenware conduits, unglazed, and of about the hardness of brick. The new work will be very costly as there are no facilities in the country for making the necessary iron pipe, and as there are several transportation monopolies between the city and points of supply the material will be heavily taxed by the time of its delivery. We are indebted to a subscriber in Central America for these particulars.

ARTESIAN WELLS.

San Angelo, Tex.—A stock company is being organized to sink a well.

Provo City, Utah.—V. L. HALLIDAY, County Clerk, received bids July 29 for furnishing and sinking 400 ft. of 3-in. artesian well pipe.

Evansville, Ind.—Bids will be received on Aug. 14 for sinking one or more wells for the Southern Hospital for Insane, by the Board of Commissioners, Governor's Office, Indianapolis, Ind. Specifications can be obtained from JOSEPH G. ROGERS, Logansport, Ind.

Houston, Tex.—The Cemetery Committee will sink another well. Address OTTO ERICKSON.

IRRIGATION.

Pecos City, Tex.—The Aztec Irrigation Co., of Reeves County, has been chartered. Capital stock, $10,000.

Helena, Mont.—The Gallitin canal has been completed. It is 22 miles long and carries 8,000 miners inches every 24 hours.

Ogalalla, Neb.—The town has voted $35,000 for a canal. It will have a 75-ft. fall and be completed in 4 months.

Lander, Wyo.—J. W. BORNER is building a 5-mile ditch. A large number of small ditches are also being constructed.

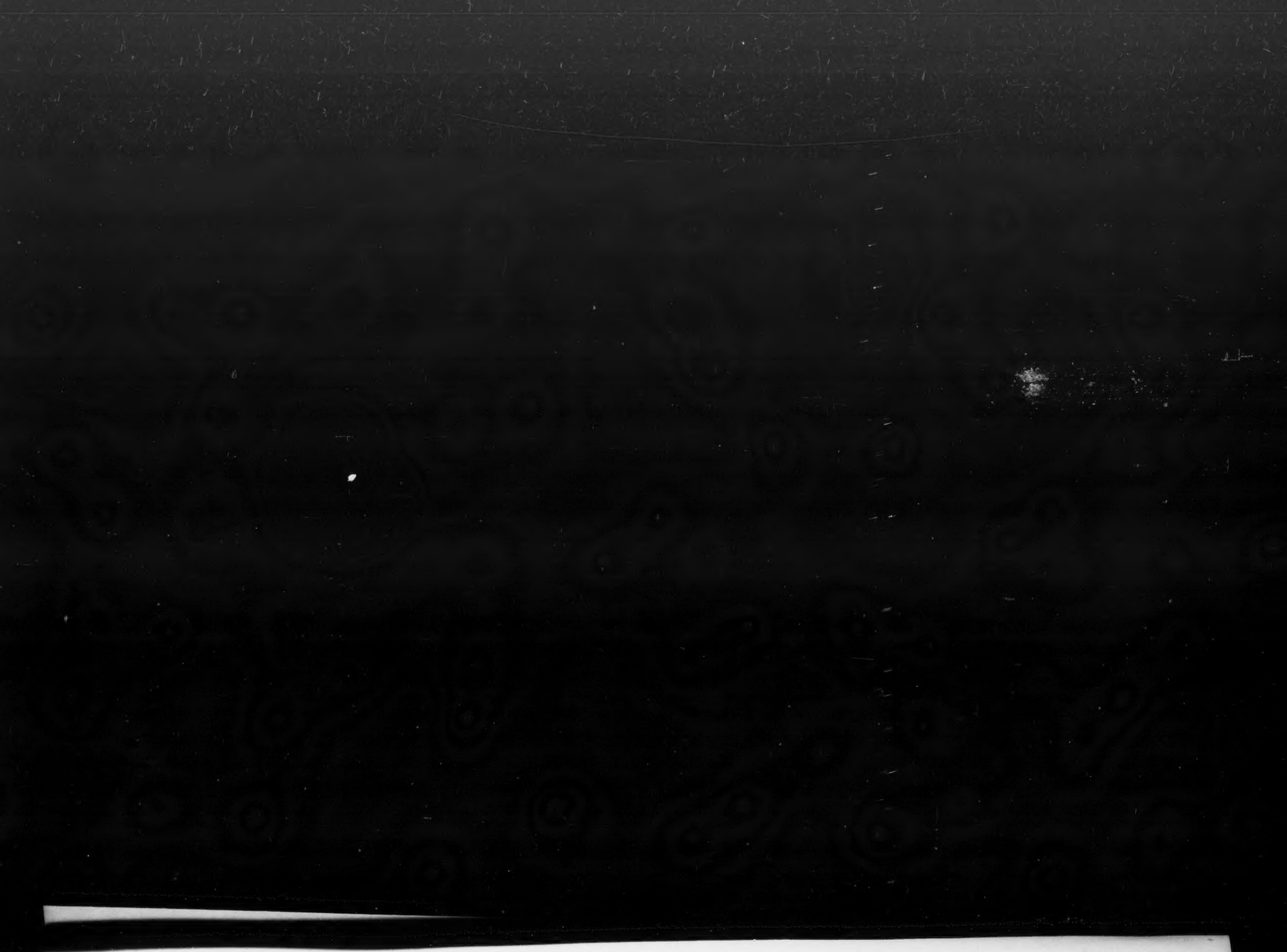
Salmon, Idaho.—A canal 4½ miles long, to convey water to Governor SHOUP's ranch, has been completed. It will reclaim 1,000 acres. Estimated cost, $15,000.

Albuquerque, N. M.—The Rio Puerco Irrigation & Improvement Co. has filed letters of incorporation. The company proposes to construct two large canals, each 120 miles long, from Copper City to the Atlantic & Pacific R. R. The work will include the building of a number of dams and reservoirs. The company represents $4,000,000 of capital. The incorporators are: MARIANO S. OTERO and CHARLES W. LEWIS, of Albuquerque; THOMAS B. CATRON, of Santa Fé County; JESSE ANTHONY, of California; and H. L. WELLS, of Colorado.

Boise City, Idaho.—Surveys for reservoirs are being made by government surveyors in this vicinity.

Ontario, Cal.—F. E. TRASK informs us that storage and irrigation works of considerable importance are being discussed.

Carson City, Nev.—A number of reservoirs will be built on the Carson river. One will be at the head of Hope Valley Cañon and draw water from Lake Tahoe. It will cover 7 sq. miles and have a depth of 50 ft. Another will be in Honey Valley, near Carson City, covering 6 sq. miles with 40 ft. of water. This will save all the surplus water of the upper Carson and of the east and west forks, which now flow into Carson lake and Carson sink. The water can then be conveyed by ditches into Churchill county. The work is in charge of government engineers.

Huron, S. Dak.—Artesian wells will probably furnish the supply for a large irrigating scheme in this vicinity. LEWIS MACLOUTH, President of the South Dakota Agricultural College, at Brookings, states that 1,000 wells would add $40,000,000, to the value of land in the James river valley.

Denver, Col.—The Chamberlin Investment Co. is mentioned in connection with a syndicate which proposes to build a large reservoir at or near the head of Cherry creek, run a ditch northeastwardly and north, and reclaim 20,000 acres of land.